88-635

No. _____

Supreme Court, U.S.
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IN THE
SUPREME COURT OF THE UNITED STATES

October Term, 1988

DEMACO CORPORATION,
PAVER SYSTEMS, INC.,
COASTAL CONTRACTING CORPORATION and
R.I. LAMPUS COMPANY,
Petitioners,

- v. -

F. VON LANGSDORFF LICENSING LIMITED and
F. VON LANGSDORFF BAUVERFAHREN GmbH,
Respondents.

ON PETITION FOR A WRIT OF CERTIORARI
TO THE UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

PETITION FOR WRIT OF CERTIORARI

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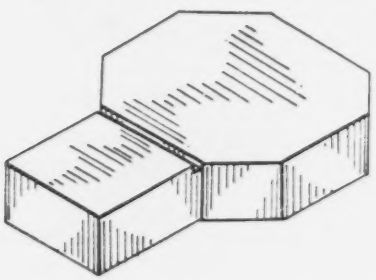
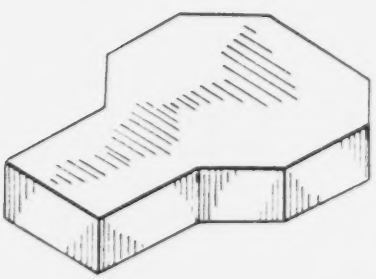
QUESTIONS PRESENTED FOR REVIEW

1. Did the Court of Appeals for the Federal Circuit, in effect, eliminate 35 U.S.C. §103 from the patent statutes by upholding a patent on a paving stone which is clearly suggested by the prior art merely because that paving stone may have enjoyed commercial success, which the District Court held was "weak"?

2. Did the Court of Appeals for the Federal Circuit fail to apply the mandates of this Court in respect of 35 U.S.C. §103 by reversing the District Court and holding that this paving stone



is patentable over this paving stone



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No._____

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- v. -

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PETITION FOR WRIT OF CERTIORARI
TO THE UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

I. OPINIONS BELOW

The opinion and judgment of the Court of Appeals for the Federal Circuit, reported at 851 F.2d 1387, reversing the District Court's judgment of patent invalidity and unenforceability are reproduced at A1 and A87, respectively.

The opinion and judgment of the District Court for the Middle District of Florida (May 22, 1986, unreported) entering judgment in favor of petitioners and finding the patent in issue invalid for obviousness and unenforceable for inequitable conduct are reproduced at A44 and A89, respectively. An order of the District Court dated March 31, 1987, amending the judgment is reproduced at A95.

II. JURISDICTION

The opinion and judgment of the Court of Appeals for the Federal Circuit sought to be reviewed was entered on June 21, 1988. This Petition for Writ of Certiorari was filed within 90 days of June 21, 1988. Jurisdiction of this Court is invoked under 28 U.S.C. §1254(1).

III. STATUTE INVOLVED

The statute involved in this case is 35 U.S.C. §103 which precludes patent protection for an invention which, even though novel under 35 U.S.C. §102, was obvious in view of the prior art. 35 U.S.C. §103 reads, in pertinent part, as follows:

> **"Conditions for patentability; non-obvious subject matter**
>
> A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences betweeen the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made."

IV. STATEMENT OF THE CASE

The District Court's jurisdiction was based upon 28 U.S.C. §§1331, 1338(a), 2201 and 2202.

Petitioners Demaco Corporation ("Demaco"), R.I. Lampus Company ("Lampus") and Paver Systems, Inc. ("Paver Systems") are corporations of Florida, Pennsylvania and Ohio, respectively, and are in the business of manufacturing concrete products, including concrete paving stones. These paving stones are used for driveways, sidewalks, roadways, patios and the like. Petitioner Coastal Contracting Corporation ("Coastal") is a Florida corporation and is in the business of installing concrete paving stones.[1]

---

[1] Rule 28.1 Statement: All parties are identified in the caption of this petition. Petitioners have no parent companies, affiliates or subsidiaries.

Respondents F. von Langsdorff Licensing Limited ("Langsdorff Licensing") and F. von Langsdorff Bauverfahren GmbH ("Langsdorff GmbH") are corporations of Canada and the Federal Republic of Germany, respectively. United States Patent No. 4,128,357 ("Barth patent", reproduced at Supplemental Appendix page 9, including Reexamination Certificate No. B1 4,128,357, reproduced at Supplemental Appendix page 35), the sole patent at issue in this case, was granted to Gunter Barth and Fritz von Langsdorff, citizens of the Federal Republic of Germany, on December 5, 1978. The Barth patent was assigned to Langsdorff GmbH and Langsdorff Licensing holds exclusive license rights from Langsdorff GmbH. Neither respondent manufactures, sells or installs concrete paving stones, rather

they engage solely in the business of licensing trademarks, patents, and technical and other information to companies in the concrete paver business.

The paving stone covered by the Barth patent is manufactured and sold by a number of concrete paver manufacturers in the United States. One segment of those manufacturers elected to take licenses under the Barth patent. Another segment of those manufacturers refused to pay tribute to what they believe to be an invalid patent.

Demaco, having been threatened under the Barth patent, brought a civil action on August 6, 1984 seeking a declaratory judgment that the Barth patent was invalid for obviousness and unenforceable for failure to disclose material prior art to the Patent and Trademark Office. Respondents filed counterclaims against

Demaco, Paver Systems, Lampus, Coastal and Krehling Industries, Inc. ("Krehling"). Krehling settled with respondents prior to trial solely on economic considerations and the lack of importance of the product.

A bench trial was held on April 7-11 and 14, 1986 before Judge William J. Castagna. In an opinion and judgment dated May 22, 1986, and amended March 31, 1987, the District Court held inter alia that claims 9, 13 and 29-33 of the Barth patent, the only claims at issue, were invalid for obviousness under 35 U.S.C. §103.

In an opinion dated June 21, 1988, the Court of Appeals for the Federal Circuit reversed the District Court's judgment that claims 9, 13 and 29-33 of the Barth patent were invalid for obviousness. Petitioners' petition for

rehearing was denied by the Federal Circuit by an Order dated July 10, 1988 (Reproduced at A91) and the suggestion for rehearing in banc was declined by an Order dated September 1, 1988 (Reproduced at A93). Circuit Judges Nies and Bissell, who were not members of the original panel, voted to rehear the case in banc.

V. ARGUMENT

The decision of the Court of Appeals for the Federal Circuit, in reversing the District Court, is in direct conflict with this Court's decisions in Graham v. John Deere Co., 383 U.S. 1 (1966), Great Atlantic & Pacific Tea Co. v. Supermarket Equipment Corp., 340 U.S. 147 (1950), Anderson's-Black Rock, Inc. v. Pavement

Salvage Co., 396 U.S. 57 (1969) and Sakraida v. Ag Pro, Inc., 425 U.S. 273 (1976).

The Federal Circuit has, in effect, decided that an invention which is novel under 35 U.S.C. §102 and which enjoys commercial success is now patentable. At best, the Federal Circuit has eroded the obviousness section of the patent statutes, 35 U.S.C. §103, so as to negate the holdings of this Court in Graham, A. & P., Anderson's-Black Rock and Sakraida; and, at worst, the Federal Circuit has effectively removed the obviousness section from the patent statutes.

The District Court properly followed the mandate of this Court on the issue of obviousness. The District Court held (A52-53):

> "The 'nonobviousness' requirement is set forth at 35 U.S.C. §103 and the seminal case on obviousness analysis is

> Graham v. John Deere Co., 383 U.S. 1 (1966). The Court is required to consider the scope and content of the prior art, evaluate the level of ordinary skill in the art at the time of the 'invention' and consider the differences between the prior art and the patent claims at issue. The Court also may consider secondary factors such as commercial success and the need filled by the product for which the patent is sought."

On the issue of commercial success the District Court held (A68-69):

> "The Court finds that secondary considerations are not significant in this case because first, the prior art so clearly indicates obviousness; second, the evidence of commercial success is weak; and third, the evidence of long felt need is nonexistent."

The District Court then concluded (A71):

> "In other words, the fact of commercial success alone does not render the product nonobvious. Notwithstanding the fact that commercial success is present, as it is to some degree in most all patent litigation, the Court finds it to be an insignificant factor in this case."

The Federal Circuit, without holding the District Court's findings on commercial success clearly erroneous, nevertheless stated at (A13):

> "The district court held that 'secondary considerations are not significant in this case because first, the prior art so clearly indicates obviousness . . . .' This misstates the law."

It is the Federal Circuit that has misstated the law and not the District Court. This Court stated in A. & P., 340 U.S. at 153:

> "The Court of Appeals and the respondent both lean heavily on evidence that this device filled a long-felt want and has enjoyed commercial success. But commercial success without invention will not make patentability."

This Court reiterated this standard in Anderson's-Black Rock, 396 U.S. at 61 (1969). In Graham v. John Deere Co., this Court stated, 383 U.S. at 17-18:

> "Under §103, the scope and content of the prior art are to be determined; differences between the prior art and the claims at issue are to be ascertained; and the level of ordinary skill in the pertinent art resolved. Against this background, the obviousness or nonobviousness of the subject matter is determined. Such secondary considerations as commercial success, long felt but unsolved needs, failure of others, etc., might be utilized to give light to the circumstances surrounding the origin of the subject matter sought to be patented. As indicia of obviousness or nonobviousness, these inquiries may have relevancy."

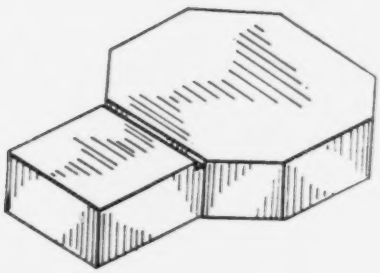
This is precisely the standard applied by the District Court.

The import of commercial success can be given no greater effect than as a secondary consideration. 35 U.S.C. §103 expressly states that obviousness shall be determined "at the time the invention was made". Looking at sales in the mid 1980's on an invention made in 1975

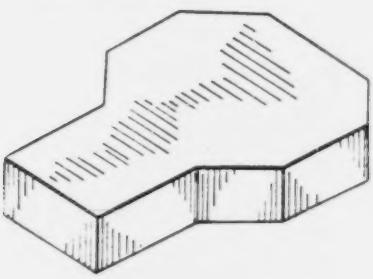
cannot be a substitute for the controlling factors specified by this Court, namely, the scope and content of the prior art, the differences between the prior art and the claims and the level of ordinary skill in the art. Anderson's-Black Rock, 396 U.S. at 62-63.

The egregiousness of the Federal Circuit's decision is apparent from a simple comparison of the paver covered by the Barth patent (Supplemental Appendix page 9) with the prior art. The Barth paver is a single stone having the surface appearance of an octagon head joined to a square stem with a dummy groove on the surface separating the head

from the stem. The following drawing more clearly shows the Barth paver:



The closest prior art is the paving stone shown in a photograph (reproduced at Supplemental Appendix page 37) published in a German newspaper. This prior art was never before the United States Patent and Trademark Office. A single paver from the German newspaper photograph is shown in the drawing below:



As can be seen clearly, the only structural difference between the Barth paver and the German newspaper paver is the dummy groove separating the square stem and octagonal head. The prior art of record (see German GM 7,409,912, for example, reproduced in part at Supplemental Appendix page 38) explicitly teaches that a dummy groove can be added to any paver to give a larger paver the appearance of smaller pavers. By simply modifying the paver shown in the German newspaper with a dummy groove, as is clearly suggested by the prior art, one skilled in the art is immediately given possession of the Barth paver.

Yet, even though the Barth invention was taught by the prior art,[2] the Federal

---

[2]The West German counterpart patent upon which the U.S. patent claims priority was held invalid in 1985 by the West German Federal Patent Court for precisely the same reasons and based on the same prior

Circuit found that commercial success (which the District Court found "weak") was sufficient to render the alleged invention patentable.

This Court has recognized that certain inventions may be commercially successful, but that does not override the mandate of §103 of the patent statute. This Court stated in Sakraida v. Ag Pro, Inc., 425 U.S. at 282-83:

> "Though doubtless a matter of great convenience, producing a desired result in a cheaper and faster way, and enjoying commercial success, Dairy Establishment 'did not produce a "new or different function". . . within the test of validity of combination patents.' Anderson's-Black Rock v. Pavement Co., supra, at 60. These desirable benefits 'without invention will not make patentability.' Great A. & P. Tea Co. v. Supermarket Corp., 340 U.S., at 153. See Dann v. Johnston, [425 U.S. 219] at 230 n. 4."

This Court also stated in Anderson's-Black Rock, 396 U.S. at 63:

> "Use of the radiant-heat burner in this important field marked a successful venture. But as noted, more than that is needed for invention."

The Federal Circuit has done precisely what this Court has said not to do. The Federal Circuit has held in the subject case that certain desirable benefits (the paving stone has the same pleasing appearance when laid in different laying patterns) when coupled with commercial success is sufficient to uphold a patent, irrespective of 35 U.S.C. §103 and the clear construction of that statute by this Court.

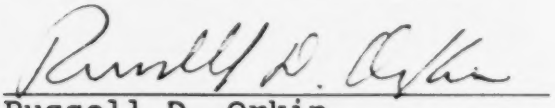
The District Court followed the statute and this Court's construction of it in holding that adding a known dummy groove to a known paver shape is obvious within the meaning of 35 U.S.C. §103. The Federal Circuit has misstated and

misapplied the statute and the proper construction of that statute as mandated by this Court. This Court should not permit such a decision to stand. It is time to direct this relatively new Court, which has under 28 U.S.C. §1295 been given exclusive jurisdiction in patent appeal cases from the District Courts, to follow the clear construction of 35 U.S.C. §103 as mandated by this Court.

VI. CONCLUSION

For the above stated reasons, petitioners respectfully request that this petition for writ of certiorari be granted.

Respectfully submitted,



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CERTIFICATE OF SERVICE

I hereby certify that the foregoing PETITION FOR WRIT OF CERTIORARI and accompanying SUPPLEMENTAL APPENDIX have been served upon Albert C. Johnston, Esq., attorney for respondents, by mailing three copies thereof by first class mail, postage prepaid, to his office at St. Onge Steward Johnston & Reens, 986 Bedford Street, Stamford, Connecticut 06905, this 14th day of October, 1988.

Russell D. Orkin

Russell D. Orkin
Counsel of Record for Petitioners

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

86-1439

DEMACO CORPORATION,

Plaintiff-Appellee,

v.

F. VON LANGSDORFF LICENSING LIMITED and F. VON LANGSDORFF BAUVERFAHREN GmbH,

Defendants-Appellants.

DECIDED: June 21, 1988

Before FRIEDMAN, NEWMAN, and ARCHER, Circuit Judges.

NEWMAN, Circuit Judge.

F. Von Langsdorff Bauverfahren GmbH and F. Von Langsdorff Licensing Ltd. (together "Langsdorff") appeal the judgment[1] in favor of declaratory

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[1] Demaco Corporation v. F. Von Langsdorff Licensing Ltd., No. 84-1051-CIV-T-15 (M.D. Fla. May 22, 1986) (amended April

judgment plaintiff Demaco Corporation and counterclaim defendants Coastal Contracting Corporation, Paver Systems, Inc., and R. I. Lampus Company (together "Demaco"). The United States District Court for the Middle District of Florida, Tampa Division, held that claims 9, 13, and 29-33 of United States Patent No. 4,128,357 ("the Barth patent") are invalid for obviousness under 35 U.S.C. §103, that all of the claims are unenforceable for inequitable conduct, and thus that the patent is not infringed. We reverse.

1, 1987).

The Patented Invention

The patent claims here at issue are for a paving stone of specific shape and proportion, as illustrated in claim 9, an agreed "typical" claim (as rewritten in independent form):

> 9. Ground covering slab elements for paving ground areas, each of said elements being a single piece of concrete consisting of a head portion and a stem portion meeting at a dummy groove allowing, but not necessitating, breakage of said slab elements into heads and stems along said dummy grooves and being delimited by two opposite end faces of equal length joined by opposite sides that form angled traces about a longitudinal axis common to said head and said stem, each said angled trace being formed by a succession of sides comprising at said head an inclined side face inclined at 45° in one direction relatively to said axis, a lateral side face extending lengthwise with respect to said axis, and another inclined side face inclined at 45° in the opposite direction with respect to the

said axis, and comprising at said stem a lateral side face extending lengthwise with respect to said axis, each said lateral face of said stem being complementary to a lateral face of said head, said end face of said head together with said inclined sides of said head and said lateral faces of said head and said dummy groove describing a centrally symmetrically [sic] octagon, said dummy groove together with said end face of said stem and said lateral faces of said stem being symmetrical about the center of said stem, and said head and said stem being mirror symmetrical about said longitudinal axis, wherein said end face of said head, said lateral faces of said head, said inclined sides of said head and said dummy groove together describe an octagon, with equal lengths of said end face, said lateral faces and said dummy grove, and with equal lengths of said inclined sides of said head, wherein said inclined sides of said head are each shorter than said end face of said head.

Appellant Langsdorff describes the advantages of the Barth paving stone as combining the feature of structural strength obtained from an elongated, interlocking paver, with the feature whereby, however the asymmetric stone is laid, the effect is the same symmetrical pattern. These characteristics are illustrated in the brochure of one of the accused infringers, wherein the Barth stone is shown along with another commercial paving stone laid in the same patterns:

> [Page 3 of the Court's opinion showing the drawing here, is reproduced at page 1 of the Supplemental Appendix]

The Barth result is achieved by using the claimed paving stone.

Validity - 35 U.S.C. §103

A

Reexamination was requested on behalf of Langsdorff on December 2, 1982, and on behalf of Demaco on January 12, 1983. Both requestors brought new references before the United States Patent and Trademark Office ("PTO"). During reexamination the examiner confirmed some of the claims without change, Barth dropped some claims, and some new claims were added. The examiner gave the following reasons for allowing the claims:

> Claims 9 and 29-33 are considered to be allowable because the prior art does not suggest a paving stone having a head shaped as an octagon with a square stem separated by a dummy groove in which inclined sides of the head are each shorter than the end face of the head. Claim 13 is considered patentable because the prior art does not suggest

> a composite pavement formed by laying plural elements having an octagon head with a square stem separated by a dummy joint [laid] in a herringbone pattern as specified. Claims 20-28 are considered allowable because the prior art does not suggest a paving stone having the specific corner angles and indentations as specified.

After the PTO issued the reexamination certificate Demaco filed this declaratory judgment action. Following a trial to the bench, the district court held asserted claims 9, 13 and 29-33 invalid for obviousness. Langsdorff argues that the district court erred in its factual findings and in its application of the law.

Langsdorff asserts that a paving stone having the structure of the Barth paver, combining its ten-sided elongated shape with its appearance of an octagon joined to a square, and accompanying

structural and visual advantages, is not shown or suggested in the prior art. Langsdorff argues that even if retrospectively simple in concept, the Barth paving stone was "a new product in a millennia old art". Langsdorff thus argues that the district court did not understand the invention, pointing to the court's statement that

> [t]he essence of the advance made by the Barth paver is to accomplish with one piece of concrete that which could be accomplished with one square piece and one octagonal piece by joining the square to the octagon.

as demonstrating that the court believed that Barth had simply joined two paving blocks into one.

The prior art showed paving stones having the general elongated shape of the Barth stone but without the dummy groove:

and the geometrical figure of an octagon joined to a square was shown in mathematics texts. The prior art also showed other paving shapes having dummy grooves. The claimed relative dimensions are not shown in the prior art. Langsdorff further states, without apparent contradiction, that this symmetrical paving stone pattern giving the apearance of two different stones is not shown or suggested in the art. Nor does the prior art describe or suggest a stone that gives to paving the structural strength obtained here while achieving a harmonious appearance whatever the pattern in which the stones are laid. Langsdorff presented evidence that it is the overall shape that provides the traffic load strength, by enabling an interlocking pavement.

The district court held that the Barth stone gave "no significant structural advantage . . . over other pavers", and that "there is no evidence that the Barth paver makes a stronger or more durable pavement". The patent statute does not require that a patentable invention be superior to all prior devices. Custom Accessories, Inc. v. Jeffrey-Allan Industries, Inc., 807 F.2d 955, 960 n.12, 1 USPQ2d 1196, 1199 n.12 (Fed. Cir. 1986) ("Finding that an invention is an 'improvement' is not a prerequisite to patentability"); G. Rich, Principles of Patentability, 28 Geo. Wash. L. Rev. 393, reprinted in 42 J. Pat. Off. Soc'y 75 (1960) (discussing "the unsound notion that to be patentable an invention must be better than the prior art"). Nor does the patent statute

require than an invention be complex in order to be nonobvious. Panduit Corp. v. Dennison Mfg. Co., 810 F.2d 1561, 1572, 1 USPQ2d 1593, 1600 (Fed. Cir.), cert. denied, 107 S. Ct. 2187 (1987):

> Though technology has burgeoned, the patent system is not limited to sophisticated technologies . . . . Nowhere in the statute or the Constitution is the patent system opened only to those who make complex inventions difficult for judges to understand and foreclosed to those who make less mysterious inventions a judge can understand . . . .

See also van Veen v. United States, 386 F.2d 462, 465, 156, USPQ 403, 405 (Ct. Cl. 1967) ("Experience has shown that some of the simplest advances have been the most nonobvious").

It was not disputed that the Barth stone possessed a combination of advantages not obtained with prior

pavers. Indeed, the chairman of accused infringer Paver Systems testified to that effect:

> Q: It's true, is it not, that the herringbone bond lay of paving stones is quite important to the strength of the pavement under traffic load?
>
> A: Yes
>
> Q: In fact, your company has stressed that in its brochures, has it not?
>
> A: Yes
>
> Q: Isn't there an advantage in having a stone suitable of a variety of bonds including herringbone rather than herringbone bond only?
>
> A: Yes
>
> Q: Is it true from your experience that when one lays multiple pavers of the [Langsdorff] shape, no matter in which orientation they are laid the resultant pavement will have the same surface appearance pattern?
>
> A: Yes
>
> Q: Now, do you know of any [interlocking] paving stone that was ever produced and sold in the United States or Canada that has the two characteristics of being suitable for a variety of bonds, including herringbone, and when laid in a variety of

> bonds in a pavement shows the same surface appearance in the pavement? . . . .
> A: No.

We conclude that the district court clearly erred in its analysis of the differences between the Barth paver and the prior art.

B

The district court held that "secondary considerations are not significant in this case because first, the prior art so clearly indicates obviousness . . . ." This misstates the law. See Ashland Oil, Inc. v. Delta Resins & Refractories, Inc., 776 F.2d 281, 306, 227 USPQ 657, 674 (Fed. Cir. 1985), cert. denied, 475 U.S. 1017 (1986) ("evidence on secondary considerations must have been considered prior to reaching a conclusion on

obviousness/nonobviousness"). This court wrote in Stratoflex, Inc. v. Aeroquip Corp., 713 F.2d 1530, 1538-39, 218 USPQ 871, 879 (Fed. Cir. 1983):

> Indeed, evidence of secondary considerations may often be the most probative and cogent evidence in the record. It may often establish that an invention appearing to have been obvious in light of the prior art was not. It is to be considered as part of all the evidence, not just when the decisionmaker remains in doubt after reviewing the art.

The commercial response to an invention is significant to determinations of obviousness, and is entitled to fair weight. Graham v. John Deere Co., 383 U.S. 1, 35-36, 148 USPQ 459, 474 (1966); Lindemann Maschinenfabrik GmbH v. American Hoist & Derrick Co., 730 F.2d 1452, 1461, 221 USPQ 481, 487 (Fed. Cir. 1984). The rationale for giving weight

to the so-called "secondary considerations" is that they provide objective evidence of how the patented device is viewed in the marketplace, by those directly interested in the product. See Graham, 383 U.S. at 35-36, 148 USPQ at 474:

> These legal inferences or subtests do focus attention on economic and motivational rather than technical issues and are, therefore, more susceptible of judicial treatment than are the highly technical facts often present in patent litigation.

and Safety Car Heating & Lighting Co. v. General Electric Co., 155 F.2d 937, 939, 69 USPQ 401, 403 (2d Cir. 1946) (L. Hand, J.):

> Courts, made up of laymen as they must be, are likely either to underrate, or to overrate, the difficulties in making new and profitable discoveries in fields with which they cannot be familiar; and, so far as it is available, they had best

> appraise the originality involved by the circumstances which preceded, attended and succeeded the appearance of the invention.

Although the district court concluded that commercial success "is an insignificant factor in this case", the record is to the contrary. At trial Demaco's counsel stated that:

> The patent has been copied . . . . Half of the industry are [licensees] . . . the other half are fighting this particular patent . . . .

The court held that Langsdorff's licensing success was "attributable to marketing efforts seeking broad relationships with licensees including several products, advertising, and technical assistance going beyond the monopoly on the Barth paver", and concluded that it had not been proved "that purchasers seek the product due to

its inherent qualities as opposed to other paving stone or nonpaving stone ground covering products." Langsdorff argues that the issue is not whether Langsdorff had a successful licensing program, but whether the patented invention was successful in the marketplace. That success was admitted by Demaco.

When a patentee asserts that commercial success supports its contention of nonobviousness, there must of course be a sufficient relationship between the commercial success and the patented invention. The term "nexus" is often used, in this context, to designate a legally and factually sufficient connection between the proven success and the patented invention, such that the objective evidence should be considered

in the determination of nonobviousness. The burden of proof as to this connection or nexus resides with the patentee. See, e.g., Cable Electric Products, Inc. v. Genmark, Inc., 770 F.2d 1015, 1027, 226 USPQ 881,888 (Fed. Cir. 1985).

In meeting its burden of proof, the patentee in the first instance bears the burden of coming forward with evidence sufficient to constitute a prima facie case of the requisite nexus. See Texas Dept. of Community Affairs v. Burdine, 450 U.S. 248, 254 n.7 (1981):

> The phrase "prima facie case" . . . may be used by courts to describe the plaintiff's burden of producing enough evidence to permit the trier of fact to infer the fact at issue.

(citing 9 J. Wigmore, Evidence § 2494 (3d ed. 1940) (hereinafter Wigmore)); E.W. Cleary, McCormick on Evidence § 342 (3rd ed. 1984) (hereinafter McCormick):

> The judge, using ordinary reasoning, may determine that fact A might reasonably be inferred from fact B, and therefore that the party has satisified his burden [of producing evidence], or as sometimes put by the courts, has made out a "prima facie" case. [footnotes omitted]

A prima facie case of nexus is generally made out when the patentee shows both that there is commercial success, and that the thing (product or method) that is commercially successful is the invention disclosed and claimed in the patent. When the thing that is commercially successful is not coextensive with the patented invention -- for example, if the patented invention

is only a component of a commercially successful machine or process -- the patentee must show prima facie a legally sufficient relationship between that which is patented and that which is sold. For example, in Hughes Tool Co. v. Dresser Industries, Inc., 816 F.2d 1549, 1556, 2 USPQ2d 1396, 1402 (Fed. Cir.), cert. denied, 108 S. Ct. 261 (1987), this court reviewed the relation between the patented feature and the thing sold and held that:

> Such continuous use of the patented feature while other features were not copied gives rise to an inference that there is a nexus between the patented feature and the commercial success.

See also Railroad Dynamics, Inc. v. A. Stucki Co., 579 F. Supp. 353, 366-67, 218 USPQ 618, 628 (E.D. Pa. 1983):

> [T]he testimony as to the advantage of the spaced structure with the biasing spring easily supports the inference that the claimed invention itself was responsible for this [commercial] success.

aff'd, 727 F.2d 1506, 220 USPQ 929 (Fed. Cir.), cert. denied, 469 U.S. 871 (1984).

When the patentee has presented a prima facie case of nexus, the burden of coming forward with evidence in rebuttal shifts to the challenger, as in any civil litigation. See Hazelwood School District v. United States, 433 U.S. 299, 314 (1977) (Stevens, J., dissenting) ("The basic framework [in a title VII action] is the same as that in any other lawsuit. The plaintiff has the burden of proving a prima facie case; if he does

so, the burden of rebutting that case shifts to the defendant"); see also McCormick § 336:

> The burden of producing evidence on an issue . . . is usually cast first upon the party who has pleaded the existence of the fact, but as we shall see, the burden may shift to the adversary when the pleader has discharged his initial duty. [footnote omitted]

It is thus the task of the challenger to adduce evidence to show that the commercial success was due to extraneous factors other than the patented invention, such as advertising, superior workmanship, etc. As discussed in Rosemount, Inc. v. Beckman Instruments, Inc., 727 F.2d 1540, 1546, 221 USPQ 1, 7 (Fed. Cir. 1984), "argument" and "conjecture" are insufficient:

> Beckman's argument that a nexus between commercial success and Cardeiro's invention is lacking

> and its conjecture that some of the commercial success here proven may have been due to elements in nonasserted claims are inadequate to overcome the objective evidence of record.

Id. Once a prima facie case of nexus is made the court must consider the evidence adduced on both sides of the question, with such weight as is warranted. See Ashland Oil, Inc. v. Delta Resins & Refractories, 776 F.2d 281, 306, 227 USPQ 657, 674 (Fed. Cir. 1985) ("The objective evidence of secondary considerations may in any given case be entitled to more or less weight, depending upon its nature and its relationship to the merits of the invention"), cert. denied, 475 U.S. 1017 (1986). When a prima facie case is made and not fully rebutted, the district court may not totally ignore the objective evidence. W.L. Gore &

Associates, Inc. v. Garlock, Inc., 721 F.2d 1540, 1555, 220 USPQ 303, 314 (Fed. Cir. 1983) ("The objective evidence of nonobviousness . . . should when present always be considered as an integral part of the analysis"), cert. denied, 469 U.S. 851 (1984).

This evidentiary routine is reflected in the decisions of this and our predecessor courts, and appears to have been followed in most trial courts. For example, in Stevenson v. U.S. Int'l Trade Comm'n, 612 F.2d 546, 204 USPQ 276 (CCPA 1979) the patentee had in the first instance provided affidavit and survey evidence of public preference for the patented skateboard; the patentee was held to have

> establish[ed] prima facie a nexus between commercial success and the merit of

> appellant's invention, the provision of an inclined foot-depressible lever.

Id. at 553, 204 USPQ at 282-83. The burden of coming forward shifted to the challenger, who presented evidence of alternative reasons for the commercial success:

> In rebuttal, to show that the commercial success is unrelated to the merits of the invention, appellees presented [a witness] who gave his opinion that the commercial success was due to cosmetic reasons.

Id. The court determined that the appellee had not overcome the prima facie case of nexus, and took the objective evidence into account in its determination of nonobviousness:

> We consider the testimony proffered by appellee to be insufficient to overcome the evidentiary value of that of appellants. The net result is a positive inference that the claimed skateboard would have

> been unobvious at the time the invention was made to one of ordinary skill in the art.

Id. at 554, 204 USPQ at 283.

A patentee is not required to prove as part of its prima facie case that the commercial success of the patented invention is not due to factors other than the patented invention. It is sufficient to show that the commercial success was of the patented invention itself. A requirement for proof of the negative of all imaginable contributing factors would be unfairly burdensome, and contrary to the ordinary rules of evidence. See 9 Wigmore § 2486 at 291 ("Thus, in most actions of tort there are many possible justifying circumstances . . .; but it would be both unfair and contrary to experience to assume that one of them was probably present and to

require the plaintiff to disprove the existence of each one of them") (emphasis in original). See also Hybritech Inc. v. Monoclonal Antibodies, Inc., 802 F.2d 1367, 1382, 231 USPQ 81, 92 (Fed. Cir. 1986), cert. denied, 107 S. Ct. 1606 (1987), where the court stated that "the record shows that advertising makes those in the industry--hospitals, doctors, and clinical laboratories--aware of the diagnostic kits but does not make these potential users buy them; the products have to work, and there is no evidence that that is not the case here or that the success was not due to the merits of the claimed sandwich assays--clearly contrary to the district court's finding." (Emphasis added.)

In the present case, Demaco admitted that the paving stone was commercially successful. In a letter written before filing suit, Demaco described this stone as "a most important segment of the paver market", and in another letter Demaco stated that "[t]his paver shape is in demand in both Georgia and Florida." It was further undisputed that it was the patented paving stone that was the thing sold in commerce. Demaco adduced no evidence to show that the paving stone's commercial success was due to any factor other than its patented structure. There was no evidence that its success was due, for example, to advertising or other factors unrelated to its technological advantages. By placing the burden on Langsdorff to prove that commercial success was <u>not</u> due primarily to

advertising or other factors such as technical service to licensees and the licensing of other products, the district court put the shoe on the wrong foot.[2] Demaco did not meet its burden of rebutting the prima facie case of nexus between the Langsdorff patented invention and its commercial success, and the district court clearly erred in its contrary finding.

Viewing all the factors pertinent to determination of obviousness, applying the guidelines of Graham v. John Deere, leads us to conclude that the presumption of validity had not been overcome by clear and convincing evidence. The

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[2]The court called the Barth paver "only a pedestrian advance".

holding of invalidity of claims 9, 13 and 29 through 33 for obviousness is reversed.

Inequitable Conduct

The district court held that the Barth patent was unenforceable for inequitable conduct, finding that German patent (Gebrauchsmuster) No. 1,998,249 ("Geb. '249") had been intentionally withheld from the PTO, and that the threshold of materiality had been met.

The concept of inequitable conduct in patent procurement derives from the equitable doctrine of unclean hands: that a person who obtains a patent by intentionally misleading the PTO can not enforce the patent. Inequitable conduct may be held although the common law elements of fraud are absent. To achieve a just application of this penalty in the

variety of situations that may arise, this court established a balancing test in American Hoist & Derrick Co. v. Sowa & Sons, Inc., 725 F.2d 1350, 1364, 220 USPQ 763, 774 (Fed. Cir.), cert. denied, 469 U.S. 821 (1984), whereby the materiality of the information that was not provided to the PTO is weighed against the intent of the actor. The court is charged with reaching an equitable result in view of the particular circumstances of the case.

Geb. '249 was disclosed to the German patent office and cited by the German examiner in connection with the German counterpart of the Barth patent. It shows a nine-sided paving stone having the laying pattern shown:

[Page 15 of the Court's opinion showing the drawing here, is reproduced at page 2 of the Supplemental Appendix]

The shape of Geb. '249 was described by the district court as "interesting in the sense that abnormal geometric forms are interesting." The court held that Geb. '249 satisfied the "but it may have been" test for materiality and should have been disclosed, although the court stated "the Court does not feel Geb. '249 is material when measured against the objective 'but for' test."

On the question of intent, the district court observed that Geb. '249 was a basis for rejection by the German

examiner, and concluded that Geb. '249 had intentionally been withheld from the United States PTO. The court found:

> The evidence shows that the applicants' German patent counsel intentionally did not provide his American counterpart with Geb. '249 despite the American attorney's inquiry specifically directed to that issue.

The "evidence" appears to consist solely of correspondence between the German attorney and the U.S. attorney, as follows:

On December 3, 1976 the German attorney wrote to the U.S. attorney stating:

> At first we would ask you to file the list of all prior art meanwhile become known to the Applicants beyond the citations made by the Examiner in the U.S. procedure.

The prior art listed by the German attorney included nine German references and one Austrian reference, including Geb. '249. Of these ten references, copies of the drawings of seven were enclosed with the letter, including the full text of two references. No copies of the remaining three (including Geb. '249) were sent.

A second letter from the German attorney dated December 10, 1976 listed four additional references cited by the German examiner, and included copies of drawings from these four references.

On December 21, 1976, the U.S. attorney sent a telex to the German attorney with the following message:

> Your letter of December 3 came without copies of listed U.M. 1957744, U.M. 1988249 [Geb. '249], and laid-open 1784497.

> Copies were received of [two other references] not mentioned in the letter. Please clarify.

The German attorney responded on December 22, 1976, as follows:

> With our letter of December 3, 1976 we intentionally did not send you the following references U.M. 1,957,744 and U.M. 1,988,249 and 'OS' 1,784,497, from among those mentioned . . . as this was not deemed necessary.

No further correspondence is of record. The U.S. attorney filed with the U.S. PTO a list of the references of which copies were sent with the December 3 and December 10 letters, along with the copies or drawings received, as required by PTO practice. The three references for which no copies were sent, including Geb. '249, were not listed.

Although the district court attributed culpable intent to the German attorney, this record does not show clear and convincing evidence thereof. The German attorney included Geb. '249 on "the list of all the prior art meanwhile become known to the Applicants". The district court did not discuss whether the U.S. attorney was delinquent, and may have deemed it exculpatory that the U.S. attorney inquired of the German attorney as to why copies of three references were not provided, and received the reply that it "was not deemed necessary". We need not speculate as to how the German attorney may have intended and the U.S. attorney may have interpreted this statement. Our task is to review whether the district court clearly erred in its finding of culpable intent. See FMC

Corp. v. The Manitowoc Co., 835 F.2d 1411, 1415, 5 USPQ2d 1112, 1115 (Fed. Cir. 1987) ("To be guilty of inequitable conduct, one must have intended to act inequitably").

Of the three unfiled references on the German attorney's list, only Geb. '249 is at issue. Although the absence of further investigation by the U.S. attorney of the possible relevance of Geb. '249 is a factor to be considered by the court, the court may consider all the surrounding circumstances. We note, for example, that Geb. '249 was listed in the German priority document filed with the PTO: this does not support a conclusion of intentional withholding. Indeed, the record contains no evidence of deliberate concealment.

> [A]n applicant who knew or should have known of the art or information, and of its materiality, is not automatically precluded thereby from an effort to convince the fact finder that the failure to disclose was nonetheless not due to an intent to mislead the PTO . . . .

Id. at 1416, 5 USPQ2d at 1116.

We conclude that there is not clear and convincing evidence to support the district court's finding of a deliberate intent to conceal Geb. '249. See id. at 1415, 5 USPQ2d at 1115 ("one who alleges a 'failure to disclose' form of inequitable conduct must offer clear and convincing proof"). The district court's finding of the intent element of inequitable conduct was therefore clearly erroneous; nor did the evidence of record establish gross negligence of such gravity as to warrant the drawing

therefrom of an inference of intent to deceive or mislead the PTO. We conclude that in these circumstances inequitable conduct has not been proved. The district court's judgment of unenforceability is reversed.

Infringement

The ruling of noninfringement flowed from the decision of invalidity and unenforceability, and was not otherwise discussed by the district court. Demaco's counsel told the court:

> [P]erhaps I should start by saying there is no question as to infringement. If the patent is held valid and enforceable, all of these parties are infringers . . . . we make no bones about it. The patent has been copied. . . . the issue of infringement just simply isn't in this case we've conceded on that point.

On this basis, we reverse the finding of noninfringement, and remand for determination of remedy.

REVERSED AND REMANDED

ARCHER, Circuit Judge, concurring.

I join the majority opinion except with respect to the majority's "Inequitable Conduct" analysis.

The German patent (Gebrauchsmuster), No. 1,988,249 (Geb. '249), in my view, fails to meet the threshold of materiality, even though a basis for rejection by the German examiner and by the U.S. examiner in the reexamination of the Barth '357 patent. It is, at best, merely cumulative of prior art disclosed. Geb. '249 discloses an asymmetrical nine-sided paving stone having a single laying pattern, as shown in the majority opinion. The U.S. examiner cited Geb.

'249 as showing "slab elements or paving modules being of a single piece of concrete consisting of a head portion and a stem portion." This much was shown by other prior art references which were before the U.S. examiner during prosecution of the Barth '357 patent. In reversing the German examiner's decision, the German Federal Patent Court stated that the

> covering element according to [Geb. '249] . . . which also has a head and a stem, is neither symmetrically designed about a longitudinal axis nor about another axis, and already for this very reason it is not suitable for giving suggestions to the person skilled in the art through which the features characterized in the claim and directed to a covering element which is symmetrical about a longitudinal axis could have been implied.

Claim 9 claims, inter alia, a "centrally symmetrically [sic] octagon" head and the head and stem "being mirror symmetrical about said longitudinal axis." Prior art references before the examiner during both the original examination of the Barth application and the reexamination proceeding disclosed paving stones or comparable elements having integral head and stem portions. Thus, even if the Geb. '249 stone had been symmetrical and of ten sides instead of nine, it would only be cumulative. Litton Industrial Products, Inc. v. Solid State Systems Corp., 755 F.2d 158, 167, 225 USPQ 34, 40 (Fed. Cir. 1985). Consequently, while the shape of Geb. '249 may have been "interesting," as the district court noted, it hardly satisfied the "but it may have been" test for

materiality as the district court held. Accordingly, it is unnecessary in my view to reach the intent question of the inequitable conduct inquiry.

UNITED STATES DISTRICT COURT
MIDDLE DISTRICT OF FLORIDA
TAMPA DIVISION

Case No. 84-1051-Civ-T-15

DEMACO CORPORATION,

Plaintiff,

vs.

F. VON LANGSDORFF LICENSING LIMITED and F. VON LANGSDORFF BAUVERFAHREN GMBH,

Defendants.

F. VON LANGSDORFF LICENSING LIMITED and F. VON LANGSDORFF BAUVERFAHREN GMBH,

Defendants/
counterclaimants,

vs.

DEMACO CORPORATION, COASTAL CONTRACTING CORPORATION, PAVER SYSTEMS, INC., and R.I. LAMPUS COMPANY,

Counterclaim
defendants.

MEMORANDUM OPINION - May 22, 1986

This primarily is a patent validity/infringement case with secondary forays into other spheres of dispute. Federal jurisdiction over the claims and counterclaims is based upon 28 U.S.C. §§ 1331, 1332, 1337, 1338, 1350, 2201 and 2202 and ancillary jurisdiction. Venue is proper in this Court.

The interests of plaintiff Demaco Corporation (Demaco), and third party defendants Coastal Contracting Corporation (Coastal), Paver Systems, Inc. (Paver Systems) and R.I. Lampus (Lampus) in this litigation essentially are identical and they shall be referred to collectively as the plaintiffs. The interests of F. Von Langsdorff Licensing Limited and F. Von Langsdorff

Bauverfahren GMBH are identical and they shall be referred to collectively as the defendants.

The plaintiffs seek a declaratory judgment that United States Patent No. 4,128,357 (the Barth patent), which is owned by defendants, is invalid and unenforceable. They contend that the subject matter of the patent, a concrete paving stone (the Barth paver), is not worthy of patent protection because it would have been obvious to one with ordinary skill in the prior art of designing paving stones. The plaintiffs also contend that the Barth patent was procured through inequitable conduct or fraud on the patent office because a known and material prior art reference intentionally was withheld from the patent examiner.

The plaintiffs further contend that the claims of the Barth patent are too imprecise to be worthy of protection, that the defendants should be estopped for laches from charging the plaintiffs with patent infringement, and that the defendants have violated antitrust laws in an effort to gain a monopoly in the paving stone industry.

The claims relating to allegations of laches, antitrust violations and the vagueness or impreciseness of the Barth patent were dismissed upon defendants' motion at the close of the plaintiffs' case in chief.

The defendants counter with claims that the plaintiffs willfully have infringed the Barth patent and have engaged in unfair competition by disparaging the defendants and

interfering with their business and contractual relations. The defendants further claim that the plaintiffs have infringed their trademarks. Finally, the defendants argue that the plaintiffs are estopped from attacking the validity of the Barth patent.

All parties contend that this is an exceptional case and seek attorneys fees under 35 U.S.C. § 285.

Paver Lock Litigation

The defendants devoted much time and effort throughout this litigation arguing that the plaintiffs should be estopped from attacking the Barth patent because Demaco, Paver Systems and Lampus participated in a common defense fund agreement relating to F. Von Langsdorff Licensing Limited et al v. Paver Lock, Inc., et al, Case No. 82-

8120 Civ. Nesbitt (Paver Lock litigation) in the Southern District of Florida. The Paver Lock litigation was a patent infringement/validity case and the common defense fund was established to assist Paver Lock in financing its defense on the infringement claims and, most mportantly, to properly finance Paver Lock's counterattack on the Barth patent.

The evidence shows that Paver Lock, Inc. was a relatively small corporation and that during the Paver Lock litigation it became insolvent. The evidence further showed that Paver Lock's owners had a falling out and went their separate ways and that none of them had any interest in continuing litigation over the Barth patent. The Paver Lock litigation ended with a default judgment for Von Langsdorff and an injunction

directed to Paver Lock, Inc. It is noteworthy that there was no consideration of the validity of the Barth patent in the Paver Lock litigation and that none of these plaintiffs were parties in that case.

The defendants agree, as they must, that in order to raise the Paver Lock litigation as an estoppel to the plaintiffs' claims that the Barth patent is invalid they must show that these plaintiffs did control the defense in the Paver Lock litigation and did cause or allow that case to go to default. The defendants have failed to make such a showing. Although the defendants make an interesting argument, and there is reason to believe that Demaco, Paver Systems and Lampus saw some potential strategic benefits in challenging the Barth patent

in another court, the evidence warrants the finding that the plaintiffs did not control the Paver Lock defense or participate in the decision to let the Paver Lock litigation go to default. Moreover, as this Court stated on June 28, 1985, "given the surrender of the defendant Paver Lock it is not clear that the contributors to the Common Defense Fund could have perpetuated the Paver Lock litigation."

It is also noteworthy that one of the plaintiffs in this case, i.e., Coastal, was not a participant in the Paver Lock litigation common defense fund agreement and there is no evidence whatsoever on which to base an estoppel argument against it.

Obviousness

The primary dispute in this case is whether or not the Barth patent is valid and enforceable. The central issue is whether the advances claimed by the Barth patent would have been obvious to one skilled in the paving stone art at the time the subject of the patent, the Barth paver, was developed. The plaintiffs concede that the Barth paver is useful and novel but contend that the paver is not patentable because it was not nonobvious.

The "nonobviousness" requirement is set forth at 35 U.S.C. § 103 and the seminal case on obviousness analysis is Graham v. John Deere Co., 383 U.S. 1 (1966). The Court is required to consider the scope and content of the prior art, evaluate the level of ordinary

skill in the art at the time of the "invention" and consider the differences between the prior art and the patent claims at issue. The Court also may consider secondary factors such as commercial success and the need filled by the product for which the patent is sought. Id. at 17-18.

It is important to note that the patent is presumed valid, see 35 U.S.C. § 282, and that the parties challenging the patent must show invalidity by clear and convincing evidence in order to defeat the claims. In this case the plaintiffs have the burden of clearly and convincingly showing that the Barth paver would have been obvious to one skilled in the paving stone art.

The appropriate starting point is a review of the claims at issue. The plaintiffs attack claims 9, 13 and 29-33 of the Barth patent.

Claim 9

> Ground covering slab elements for paving ground areas, each of said elements being a single piece of concrete consisting of a head portion and a stem portion meeting at a dummy groove allowing, but not necessitating, breakage of said slab elements into heads and stems along said dummy grooves and being delimited by two opposite end faces of equal length joined by opposite sides that form angled traces about a longitudinal axis common to said head and said stem, each said angled trace being formed by a succession of sides comprising at said head an inclined side face inclined at 45 degrees in one direction relatively to said axis, a lateral side face extending lengthwise with respect to said axis, and another inclined side face inclined at 45 degrees in the opposite direction with respect to the said axis, and comprising at said stem a lateral side face extending

lengthwise with respect to said axis, each said lateral face of said stem being complementary to a lateral face of said head, said end face of said head together with said inclined sides of said head and said lateral faces of said head and said dummy groove describing a centrally symmetrically [sic] octagon, said dummy groove together with said end face of said stem and said lateral faces of said stem being symmetrical about the center of said stem, and said head and said stem being mirror symmetrical about said longitudinal axis, wherein said end face of said head, said lateral faces of said head, said inclined sides of said head and said dummy groove together describe an octagon, with equal lengths of said end face, said lateral faces and said dummy groove, and with equal lengths of said inclined sides of said head, wherein said inclined sides of said head are each shorter than said end face of said head.

Claim 13

A composite paving structure consisting essentially of ground covering slab elements, said elements being laid laterally side by side so as to form a

substantially continuous paving, each said element being a single piece of concrete consisting of a head portion and a stem portion meeting at a dummy groove allowing, but not necessitating, breakage of said slab elements into heads and stems along said dummy grooves and being delimited by two opposite end faces of equal length joined by opposite sides that form angled traces about a longitudinal axis common to said head and said stem, each said angled trace being formed by a succession of sides comprising at said head an inclined side face inclined at 45 degrees in one direction relatively to said axis, a lateral side face extending lengthwise with respect to said axis, and another inclined side face inclined at 45 degrees in the opposite direction with respect to said axis, and comprising at said stem a lateral side face extending lengthwise with respect to said axis, each said lateral face of said stem being complementary to a lateral face of said head, said end face of said head together with said inclined sides of said head and said lateral faces of said head and said dummy groove describing a centrally symmetrical octagon, said dummy groove together with

said end face of said stem and said lateral faces of said stem being symmetrical about the center of said stem, and said head and said stem being mirror symmetrical about said longitudinal axis, wherein said elements are laid in herringbone bond pattern with said axes of said elements in one row thereof disposed at an angle of 90 degrees to said axes of said elements in an adjacent row thereof and with said stem of said elements in a row thereof inclined in like sense at an angle of 45 degrees to the direction of the row.

Claim 29

Paving stones for covering ground areas by being laid onto them each stone beside others, each said stone being a unitary shaped piece of concrete substantially longer than it is wide and mirror symmetrical relative to its central longitudinal axis, each said stone consisting of a centrally symmetrical head portion centered on said axis and a centrally symmetrical stem portion centered thereon and of less width than said head portion, said head portion being delimited by seven rectilinear side faces and a rectilinear notional plane throughout which said head

portion is integral with said stem portion, one of said side faces being an end face of the stone, two being inclined outward from said end face at an angle of 45 degrees to said axis, two being lateral faces extending parallel to said axis from said inclined faces, and two being inclined inward from said lateral faces at an angle of 45 degrees to said axis with their respective inner ends delimiting said notional plane, said stem portion being delimited by said notional plane and three rectilinear side faces of which two are lateral faces extending parallel to said axis from said inner ends and the third is the other end face of said piece, said lateral faces, said end faces and said notional plane all being of equal length, said inclined faces all being of equal length but substantially shorter than said end faces and said lateral faces, each said stone having a rectilinear dummy jointing gap formed in and across its upper side between the said inner ends, each said stone being layable beside others of said stones in any of several different patterns of load-resistant interengagement, including a herringbone bond pattern, in all of which the stones give

the surface appearance of octagonal stones laid beside square stones, said dummy jointing gap in each stone constituting a predetermined rupture zone along which the stone if overloaded in a pavement can break without noticeable change of said surface appearance.

Claim 30

A paving stone according to claim 29, said side faces of each of said stones being substantially vertrical and having oblique chamfered surfaces along their upper edges.

Claim 31

Slab elements for paving ground areas, each of said elements being a single piece of concrete consisting of a head portion and a stem portion meeting at a dummy groove allowing, but not necessitating, breakage of said slab elements into heads and stems along said dummy grooves and being delimited by two opposite end faces of equal length joined by opposite sides that form angled traces about a longitudinal axis common to said head and said stem, each said angled trace being formed by a succession of sides comprising at said head an

inclined side face inclined at 45 degrees in one direction relatively to said axis, a lateral side face extending lengthwise with respect to said axis, and an other [sic] inclined side face inclined at 45 degrees in the opposite direction with respect to the said axis, and comprising at said stem a lateral side face extending lengthwise with respect to said axis, each said lateral face of said stem being complementary to a lateral face of said head, said groove, said end faces, said inclined faces and said lateral faces each being rectilinear, said end faces, said lateral faces and said groove having equal lengths, said inclined side faces having equal lengths but each being substantially shorter than said end face of said head, said end face of said head together with said inclined sides of said head and said lateral faces of said head and said dummy groove describing a centrally symmetrical octagon, said dummy groove together with said end face of said stem and said lateral faces of said stem describing a square and being symmetrical about the center of said stem, and said head and

said stem being mirror symmetrical about said longitudinal axis.

Claim 32

A composite ground covering structure comprising a multiplicity of paving stones according to claim 29, 30 or 31, laid on a ground surface each beside others and forming a substantially continuous pavement of interengaged stones over said ground surface, said pavement irrespective of the pattern or patterns of interengagement of said stones giving substantially the same surface appearance as a pavement composed of octagonal stones and square stones.

Claim 33

A composite ground covering structure according to claim 32, at least some of said stones being interengaged in herringbone bond pattern with the longitudinal axes of stones in a row disposed at an angle of 90 degrees to said axes of stones in an adjacent row and inclined in line direction at an angle of 45 degrees to the direction of the row.

In less precise, or perhaps less obfuscatory, but somewhat more understandable terms those claims describe a brick-like paving stone with the surface appearance of an octagon shaped head portion joined to a square shaped stem portion with a dummy groove on the surface suggesting the line where the stem and head are joined (such groove providing the impression of the fourth side of the square meeting the eighth side of the octagon). The claims also show that the inclined sides of the octagon may be shorter than the other sides and indicate a variety of laying patterns. See, e.g., Exhibits A-E. [Exhibits A-E to the Court's opinion are reproduced at pages 3-7 of the Supplemental Appendix].

The parties have provided much evidence of the prior paving stone art and of analogous arts and the Court has assessed the relevance of those arts and what they taught at the time the Barth paver was developed. The evidence shows clearly that the relevant prior art included teachings from the design and construction arts relating to paving stones, concrete pavements, concrete pavers and other ground coverings and from analogous arts relating to the design and use of ceramics, primarily ceramic tiles, and floor and wall coverings. Moreover, it is undisputed that a person of ordinary skill in the paving stone art would have had a college education and would have had exposure and access to each of the above areas of knowledge.

The evidence as to the state of the prior art and the ordinary skill in art is in the form of expert testimony, prior patents and published materials. Moreover, the evidence in this case includes prior art references that were not before the examiner in the patent proceedings. The prior art teaches the use of concrete pavers for the purpose of covering the ground and teaches that such pavers can be manufactured in many shapes and sizes, octagons and squares included, and that they can be laid in many patterns, including patterns calling for square pavers to be used with octagonal pavers. The prior art teaches the design of a ten sided tile giving the appearance of an octagon and a square joined into one continuous unitary shape and shows that such tile was used to line the

swimming pool on board the ocean liner Queen Elizabeth II, a ship that often docked in the United States, and that such use was photographed and reported in a trade newspaper in Glasgow, Scotland in 1968. The prior art also teaches a design having the overall surface appearance of a Barth paver, without a dummy groove, being incorporated into an outdoor ground covering as shown by a microfiche reproduction of a 1974 West German newspaper account of the opening of the Muenster Zoo. The prior art further teaches that the geometric shape of the Barth paver was suggested strongly by text and sketch in the 1930 edition of NEW MATHEMATICAL PASTIMES, a work reviewing design applications of mathematics and geometry. See P. MacMahon, NEW MATHEMATICAL PASTIMES 112-

13 (1930) (a very well known repeating pattern for linoleum, pavements, etc. viz, the combination of the regular octagon and the square). The prior art teaches that pavers can be made to appear like two shapes and teaches the use of dummy grooves, chamfers, and bevels. Moreover, the prior art teaches that pavers can be made to lay evenly side by side and to fit tightly together and interlock for structural stability. Finally, the prior art teaches that pavers can be laid by hand or with mechanical assistance.

Notwithstanding the deference to be given to the decision of the patent examiner, the Court concludes that the evidence of the prior art and the ordinary skill in the art clearly and convincingly shows that the Barth paver

and the claims at issue do not constitute invention because their subject matter as a whole does not clear the hurdle of 35 U.S.C. § 103. One with ordinary skill in the paving stone art would have found the Barth paver to be obvious despite the fact that it seemingly was new and is useful. The essence of the advance made by the Barth paver is to accomplish with one piece of concrete that which could be accomplished with one square piece and one octagonal piece by joining the square to the octagon. Conceding the possible added utility of handling one paver rather than two, it is apparent that there is no laying pattern that can be achieved with the Barth paver that cannot be achieved using squares and octagons. That conclusion is only reinforced by the defendants' constant emphasizing that the

surface appearance of the Barth Paver camouflages the fact that square pavers and octagonal pavers are not present. The laying pattern potential of the Barth paver is a function of the geometry of the octagon and the square, not of the ten sided "Barthagon." Moreover, the evidence shows that there is no significant structural advantage realized through the use of the Barth paver over other pavers and there is no evidence that the Barth paver makes a stronger or more durable pavement. In short, the Barth paver represents only a pedestrian advance over the prior paving art.

The defendants offered some evidence and much argument about the commercial success of the Barth paver and about the fact that it was a new product in a millennia old art. The Court finds

that secondary considerations are not significant in this case because first, the prior art so clearly indicates obviousness; second, the evidence of commercial success is weak; and third, the evidence of long felt need is non existent. As to commercial success in general, the defendants' licensing agreements involve much more than patent rights on the Barth paver and it is apparent that a large amount of defendants' business success is attributable to marketing efforts seeking broad relationships with licensees including several products, advertising, and technical assistance going beyond the monopoly on the Barth paver. With regard to the commercial success of the Barth Paver, the Court notes that commercial success of the patented product is the

raison d'etre of patent litigation and that the relevance of commercial success to obviousness analysis is a function of the degree of success. The evidence in this case does not show particularly impressive commercial success attributable to the product alone and the Court finds the evidence of revenues to be inconclusive. The evidence of royalties and sales is not worthy of much credit because the data offered clearly was not carefully compiled or presented. It is apparent, for example, that currency exchange differences have not properly been taken into account. Moreover, sales and royalty data cannot provide the full picture of commercial success. There is no competent evidence of market share or that purchasers seek the product due to its inherent qualities

as opposed to other paving stone or nonpaving stone ground covering products. In other words, the fact of commercial success alone does not render the product nonobvious. Notwithstanding the fact that commercial success is present, as it is to some degree in most all patent litigation, the Court finds it to be an insignificant factor in this case.

Trademark Claim

The defendants charge plaintiffs with trademark infringement. The case in support of that claim is focused against Paver Systems and is so weak that if the claim cannot be called frivolous, it is at least petty.

The evidence showed that while Paver Systems was a licensee of defendants' trademark it accepted an order for a load of concrete paving

stones to be shipped to Florida and prepared and packed the stones for shipment. Shortly thereafter, Paver Systems withdrew from the licensing arrangement it had with the defendants and thereby lost the right to use the trademark in question. Subsequent to Paver Systems' withdrawal from the licensing agreement the previously sold and packed shipment of paving stones was shipped to Florida with packing labels attached bearing the defendants' trademark. This isolated use of defendants' trademark is the basis of the infringement claim.

The Court concludes that such circumstances at best constitute a technical violation and that in this case the error was de minimus and inadvertent. There is no evidence that the defendants

suffered any injury or damage from that isolated incident and the Court finds none.

Disparagement and Tortious Interference

The evidence shows that the plaintiffs communicated with other manufacturers in the paving stone industry and told them that the Barth patent probably was invalid for substantive reasons and because it may have been procured through fraud in the patent application process. The apparent purpose of such communications was to solicit financial assistance for litigation to challenge the validity of the patent.

The defendants contend that such communications interfered with the relationships they had with licensees and potential licensees and that such

communications were defamatory. However, the evidence did not show any instance in which any communication, written or otherwise, originating from these plaintiffs had any cognizable adverse effect upon a business or contractual relationship.

With respect to the contention that defendants have been defamed by accusations of fraud relating to the procurement of the Barth patent the Court notes that in this context fraud is not common law fraud but patent fraud or more precisely fraud on the patent office and the Court finds that in this case the plaintiffs had a reasonable basis for making such statements as were made in the various letters they sent to other manufacturers. For the most part, those communications reference or allude to

opinions of patent attorneys and simply state the grounds for attacking the validity of the patent. It is perhaps unfortunate that "fraud" is one of the terms used in patent law to describe a failure to disclose but the Court finds nothing in this case that fairly can be characterized as defamatory.

Inequitable Conduct

The plaintiffs contend that the defendants intentionally withheld from the United States Patent Office prior art consisting of West German Gebrauchsmuster (Patent) No. 1,988,249 (Geb. '249) and that such withholding or nondisclosure constitutes inequitable conduct or fraud on the patent office. At trial the plaintiffs conceded that in view of J.P. Stevens & Co., Inc. v. Lex Tex Ltd., Inc., 747 F.2d 1553 (Fed.Cir. 1984),

cert. denied, 106 S.Ct. 73 (1985), "inequitable conduct," as opposed to "fraud," is now the preferred label to place on allegations of nondisclosure or false disclosure of material information before the Patent Office.

There are three steps to an "inequitable conduct" analysis. First, the Court must determine whether the information withheld would have been material to the examination and materiality must be shown by clear and convincing evidence. Second, the Court must determine whether the nondisclosure was intentional with the purpose to mislead. Third, the Court must weigh and balance the materiality and the intent.

There are four accepted tests for assessing the materiality of the withheld information. They are 1) the

objective "but for" test; 2) the subjective "but for" test; 3) the "but it may have been" test; and 4) the PTO Rule 1.56(a) test (substantial likelihood that a reasonable examiner would have considered the omitted reference important in deciding whether to allow the application to issue as a patent) See Lex Tex, 747 F.2d at 1559; American Hoist & Derrick Co. v. Sowa & Sons, 725 F.2d 1350 (Fed. Cir.1984). The Court notes that the subjective "but for" test appears not be appropriate in this case because the patent examiner did not testify and there is no evidence to support that theory. See American Hoist, 725 F.2d at 1363 n. 4.

The appropriate starting point in the materiality analysis is the PTO Rule 1.56 test. PTO Rule 1.56(a) states as follows:

> § 1.56 Duty of disclosure; fraud; striking or rejection of applications.
>
> (a) A duty of candor and good faith toward the Patent and Trademark Office rests on the inventor, on each attorney or agent who prepares or prosecutes the application and on every other individual who is substantively involved in the preparation or prosecution of the application and who is associated with the inventor, with the assignee or with anyone to whom there is an obligation to assign the application. All such individuals have a duty to disclose to the Office information they are aware of which is material to the examination of the application. Such information is material where there is a substantial likelihood that a reasonable examiner would consider it important in deciding whether to allow the application to issue as a patent. The duty is commensurate with the degree of

> involvement in the preparation or prosecution of the application.
>
> 37 CFR 1.56 (1985)

The evidence shows that the duty of disclosure as codified at PTO Rule 1.56 existed at all times material to this litigation notwithstanding the fact that the initial Barth application (Serial No. 672,727) was filed prior to the codification of that rule.

The issue then is whether there is a substantial likelihood that the patent examiner would have considered Geb. '249 important in deciding whether to allow the application to issue or whether, as defendants suggest, Geb. '249 would simply have been one more cumulative pea in the prior art pod.

Geb. '249 teaches a brick-like nine-sided paving stone with a rectilinear stem portion and an a-typical octagonal head portion. See Exhibit F. [Exhibit F to the Court's opinion is reproduced at page 8 of the Supplemental Appendix]. The notional line of the fourth side of the square stem reveals also the seventh side of the octagon. The eighth side of the octagon is that portion of what at first appears to be the long side of the stem that is above the intersection of the notional line. Unlike the Barth paver, Geb. '249 does not have a dummy groove. The shape of Geb. '249 is interesting in the sense that abnormal geometric forms are interesting. By appearance, Geb. '249 might be considered somewhat similar to the Barth paver and if the two were

related they perhaps could be cousins. (The record includes two paving stones. Plaintiffs' exhibit 93 is the Barth paver and plaintiffs' exhibit 23 is a reproduction of a Geb. '249.)

In the context of a review of prior art this Court is clearly convinced that Geb. '249 is material information. As the German patent examiner stated in his decision rejecting the Barth paver's German patent application, Geb. '249 "discloses a paving unit consisting of a first element and a second element (denoted there as an octagonal surface or alternatively, as a rectangular surface)" and teaches "to construct the first and second element as an integral form piece and to lay them together." See German Patent Office Decision, P 25 15 210.7-25 October 18, 1979 (Translation at

plaintiff's exhibit 68). Such are important aspects of the Barth paver and the fact that the German patent examiner singled out Geb. '249 from the prior art as significant only reinforces this Court's view that Geb. '249 is material and that the patent applicant should have realized as much. That is not to say that Geb. '249 would have been conclusive or would necessarily have changed the United States patent examiner's mind about the patentability of the Barth paver (i.e., the Court does not feel Geb. '249 is material when measured against the objective "but for" test) but only that Geb. '249 is material information when measured against the PTO standard or the "but it may have been" test and it should have been disclosed. See, e.g., Plastic Container Corp. v. Continental

Plastics, 607 F. 2d 885, 899 (10th Cir. 1979) (explanation of objective "but for," subjective "but for," and "but it might have been" tests for materiality).

The next prong of the analysis is intent to mislead. In this case there is direct evidence that the patent applicants were aware of Geb. '249, had disclosed it as prior art in Germany and intentionally withheld it from the United States patent examiner with no reasonable basis for considering it to be cumulative or "just one more pea in the pod." The evidence shows that the applicants' German patent counsel intentionally did not provide his American counterpart with Geb. '249 despite the American attorney's inquiry specifically directed to that issue.

The Court finds that the evidence shows that the plaintiffs have met their burden of showing materiality and intent and that "the scales tilt to a conclusion that inequitable conduct occurred." See Lex Tex, 747 F. 2d at 1560. Consequently, the claims of the Barth patent are unenforceable.

In accordance with the foregoing, it is

ORDERED

1. That judgment be entered for F. Von Langsdorff Licensing Limited and F. Von Langsdorff Bauverfahren Gmbh and against Demaco Corporation, Coastal Contracting Corporation, Paver Systems, Inc. and R.I. Lampus Company on the claim that the claims of United States Patent No. 4,128,357 are imprecise and the claim

that F. Von Langsdorff Licensing Limited and F. Von Langsdorff Bauverfahren Gmbh committed antitrust violations.

2. That judgment be entered for Demaco Corporation, Coastal Contracting Corporation, Paver Systems, Inc. and R.I. Lampus Company and against defendants F. Von Langsdorff Licensing Limited and F. Von Langsdorff Bauverfahren Gmbh:

a) declaring United States Patent No. 4,128,357 invalid for obviousness and unenforceable for inequitable conduct;

b) on the claim that Demaco, Coastal, Paver Systems and Lampus engaged in unfair competition and tortious interference with contractual relations;

c) on the claim that Demaco, Coastal, Paver Systems and Lampus engaged in trademark infringement;

d) on the claim that Demaco, Coastal, Paver Systems and Lampus committed patent infringement; and

e) for the costs of this action.

3. That each party shall bear its own attorneys' fees.

DONE AND ORDERED at Tampa, Florida this 22nd day of May, 1986.

/s/ William J. Castagna
WILLIAM J. CASTAGNA
UNITED STATES DISTRICT JUDGE

Copies to Counsel of Record

UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

86-1439

DEMACO CORPORATION,

Plaintiff-Appellee,

v.

F. VON LANGSDORFF LICENSING LIMITED and
F. VON LANGSDORFF BAUVERFAHREN GmbH,

Defendants-Appellants.

Judgment

ON APPEAL from the U.S. District Court for the Middle District of Florida, Tampa Division

in CASE NO(S). 84-1051-Civ-T-15

This CAUSE having been heard and considered it is

ORDERED and ADJUDGED: REVERSED AND REMANDED

ENTERED BY ORDER OF THE COURT

/s/ Francis X. Gindhart
Francis X. Gindhart, Clerk

DATED JUN 21 1988

ISSUED AS A MANDATE: July 27, 1988
Costs: Against; Appellee
Printing $1,759.30
Total. $1,759.30

United States District Court
MIDDLE DISTRICT OF FLORIDA

DEMACO CORPORATION,

Plaintiff,
V.

F. VON LANGSDORFF LICENSING, LIMITED, et al.,

Defendants

CASE NUMBER 84-1051-Civ-T-15

JUDGMENT IN A CIVIL CASE

___ Jury Verdict. This action came before the Court for a trial by jury. The issues have been tried and the jury has rendered its verdict.

_x_ Decision by Court. This action came to trial or hearing before the Court. The issues have been tried or heard and a decision has been rendered.

IT IS ORDERED AND ADJUDGED

That Judgment is hereby entered in accordance with the Memorandum Opinion entered on May 22, 1986.

May 22, 1986
Date

DONALD M. CINNAMOND
Clerk

/s/ Geraldine Greene
(by) Deputy Clerk

United States Court of Appeals for the Federal Circuit

86-1439

DEMACO CORPORATION,

Plaintiff-Appellee,

v.

F. VON LANGSDORFF LICENSING LIMITED and F. VON LANGSDORFF BAUVERFAHREN GmbH,

Defendants-Appellants.

Before FRIEDMAN, NEWMAN, and ARCHER, Circuit Judges.

O R D E R

A petition for rehearing having been filed in this case,

UPON CONSIDERATION THEREOF, it is ORDERED that the petition for rehearing be, and the same hereby is, denied.

The suggestion for rehearing in banc is under consideration.

FOR THE COURT:

/s/ Francis S. Gindhart
Francis X. Gindhart, Clerk

7/10/88
Date

cc: Mr. Albert C. Johnston
Mr. Russell D. Orkin

United States Court of Appeals for the Federal Circuit

86-1439

DEMACO CORPORATION,

Plaintiff-Appellee,

v.

F. VON LANGSDORFF LICENSING LIMITED and F. VON LANGSDORF BAUVERFAHREN GmbH,

Defendants-Appellants.

O R D E R

A suggestion for rehearing in banc having been filed in this case, and a response thereto having been invited by the court and filed,

UPON CONSIDERATION THEREOF, it is

ORDERED that the suggestion for rehearing in banc is declined.

Judge Nies and Bissell would grant the suggestion for rehearing in banc.

FOR THE COURT:

/s/ Francis X. Gindhart
Francis X. Gindhart, Clerk

9/1/88
Date

cc: Mr. Albert C. Johnston
Mr. Russell D. Orkin

UNITED STATES DISTRICT COURT
MIDDLE DISTRICT OF FLORIDA
TAMPA DIVISION

DEMACO CORPORATION,

Plaintiff,

v.

F. VON LANGSDORFF LICENSING LIMITED and F. VON LANGSDORFF BAUVERFAHREN GmbH,

Defendants,

F. VON LANGSDORFF LICENSING LIMITED and F. VON LANGSDORFF BAUVERFAHREN GmbH,
Defendants-counter-claimants,

v.

DEMACO CORPORATION, COASTAL CONTRACTING CORPORATION, PAVER SYSTEMS, INC., and R. I. LAMPUS COMPANY
Counterclaim Defendants.

Case No. 84-1051-Civ-T-15

ORDER - March 31, 1987

The Court has considered defendants' motion for relief from judgment and the plaintiff's response. Plaintiff is correct in its assertion that the Court's ruling on materiality did not result from any translation error in plaintiff's exhibit 68. Rather, the ruling on materiality was based on the Court's own viewing of Geb. '249 and the Court's recognition that the German examiner considered Geb. '249 to be significant. Consequently, defendant's motion for relief will be denied. However, because both sides have pointed out that only claims 9, 13, and 29-33 of the Barth patent were at issue in connection with the obviousness

allegations, the Court's final order and judgement must be amended in that regard and therefore, it is

ORDERED:

1. Defendant's motion for relief from judgment (D 134) is granted to the limited extent that the following language on page 24 of the Court's order of May 22, 1986 is deleted:

> a) declaring United States Patent No. 4,128,357 invalid for obviousness and unenforceable for inequitable conduct

and the following language is substituted therefor:

> a) declaring claims 9, 13 and 29-33 of United States Patent No. 4,128,357 invalid for obviousness and also declaring United States Patent No. 4,128,357 unenforceable for inequitable conduct.

Defendant's motion for relief is denied in all other respects.

2. Defendants' motion to defer taxation of costs pending resolution of appeal (D 139) is denied.

DONE AND ORDERED at Tampa, Florida this 31st day of March, 1987.

/s/ William J. Castagna
WILLIAM J. CASTAGNA
UNITED STATES DISTRICT JUDGE

Copies to Counsel of Record

88-635

Supreme Court, U.S.
FILED
SEP 19 1988
JOSEPH F. SPANIOL, JR.
CLERK

No. _____

IN THE
SUPREME COURT OF THE UNITED STATES

October Term, 1988

DEMACO CORPORATION,
PAVER SYSTEMS, INC.,
COASTAL CONTRACTING CORPORATION and
R.I. LAMPUS COMPANY,

Petitioners,

- v. -

F. VON LANGSDORFF LICENSING LIMITED and
F. VON LANGSDORFF BAUVERFAHREN GmbH,

Respondents.

ON PETITION FOR A WRIT OF CERTIORARI
TO THE UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

SUPPLEMENTAL APPENDIX

Russell D. Orkin
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Pittsburgh, PA 15222-2363
Counsel for Petitioners

Richard L. Byrne
Webb, Burden, Ziesenheim
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515 Oliver Building
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(412) 471-8815
Of Counsel

SUPPLEMENTAL APPENDIX

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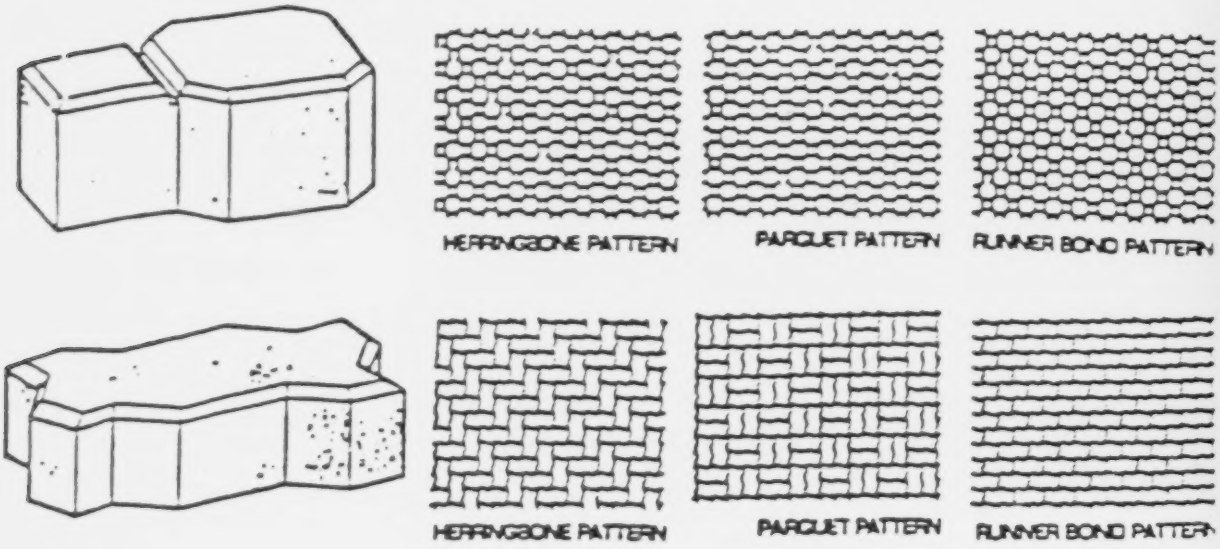
United States Patent No. 4,128,351	9
Reexamination Certificate No. B1 4,128,351	35
Plaintiff's Exhibit 13	37
Portions of Plaintiff's Exhibit 7H	38

same symmetrical pattern. These characteristics are illustrated in the brochure of one of the accused infringers, wherein the Barth stone is shown along with another commercial paving stone laid in the same patterns:



The Barth result is achieved by using the claimed paving stone.

Validity - 35 U.S.C. § 103

A

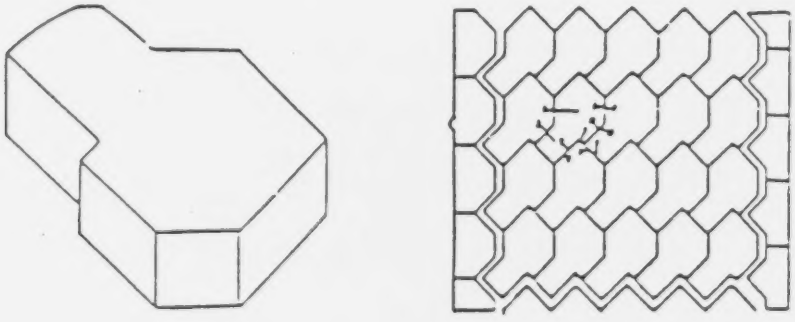
Reexamination was requested on behalf of Langsdorff on December 2, 1982, and on behalf of Demaco on January 12, 1983. Both requesters brought new references before the United States Patent and Trademark Office ("PTO"). During reexamination the examiner confirmed some of the claims without change, Barth dropped some claims, and some new claims were added. The examiner gave the following reasons for allowing the claims:

> Claims 9 and 29-33 are considered to be allowable because the prior art does not suggest a paving stone

SAI

Co. v. Sowa & Sons, Inc., 725 F.2d 1350, 1364, 220 USPQ 763, 774 (Fed. Cir.), cert. denied, 469 U.S. 821 (1984), whereby the materiality of the information that was not provided to the PTO is weighed against the intent of the actor. The court is charged with reaching an equitable result in view of the particular circumstances of the case.

Geb. '249 was disclosed to the German patent office and cited by the German examiner in connection with the German counterpart of the Barth patent. It shows a nine-sided paving stone having the laying pattern shown:



The shape of Geb. '249 was described by the district court as "interesting in the sense that abnormal geometric forms are interesting." The court held that Geb. '249 satisfied the "but it may have been" test for materiality and should have been disclosed, although the court stated "the Court does not feel Geb. '249 is material when measured against the objective 'but for' test."

On the question of intent, the district court observed that Geb. '249 was a basis for rejection by the German examiner, and

SA2

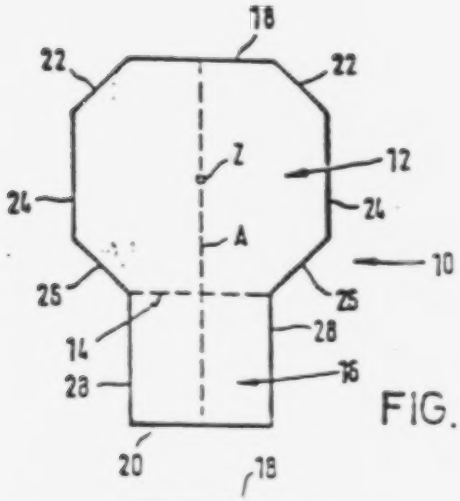


FIG. 1

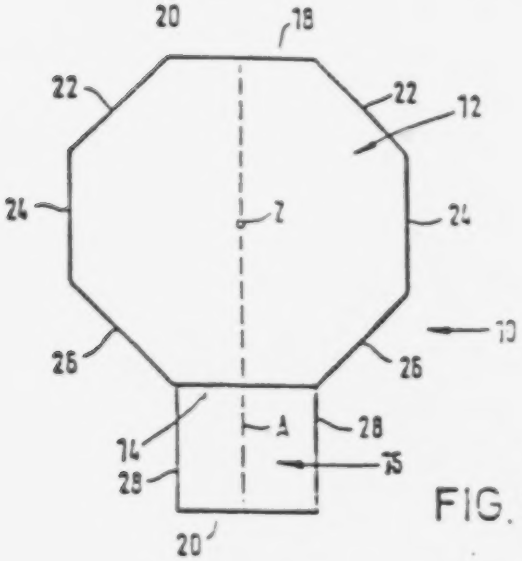


FIG. 2

EXHIBIT A

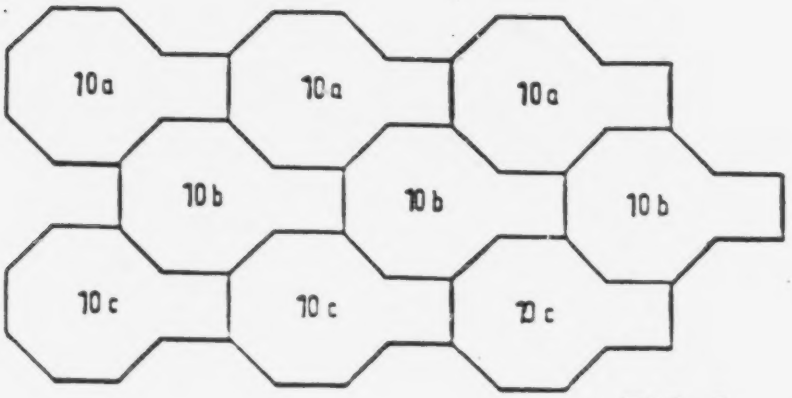


FIG. 3

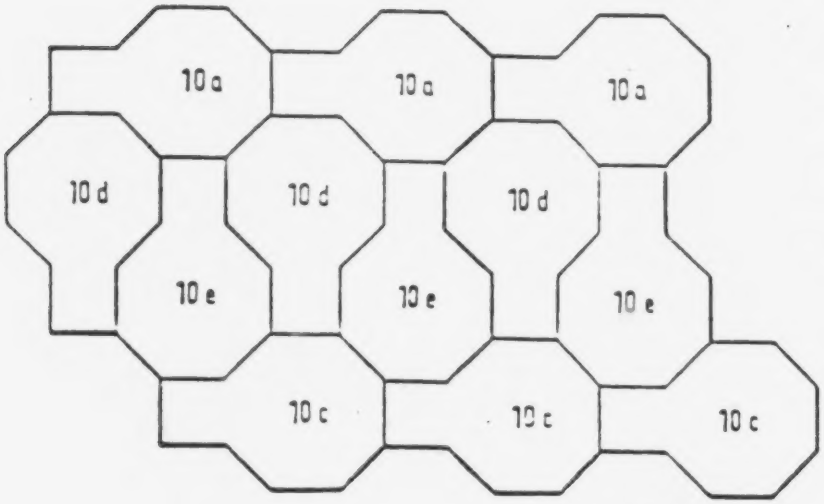


FIG. 4

EXHIBIT B

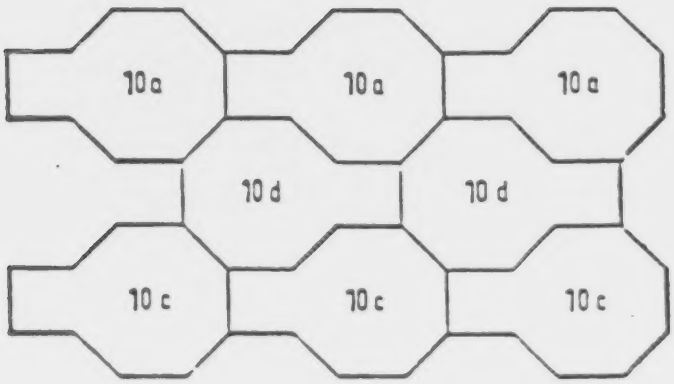


FIG. 5

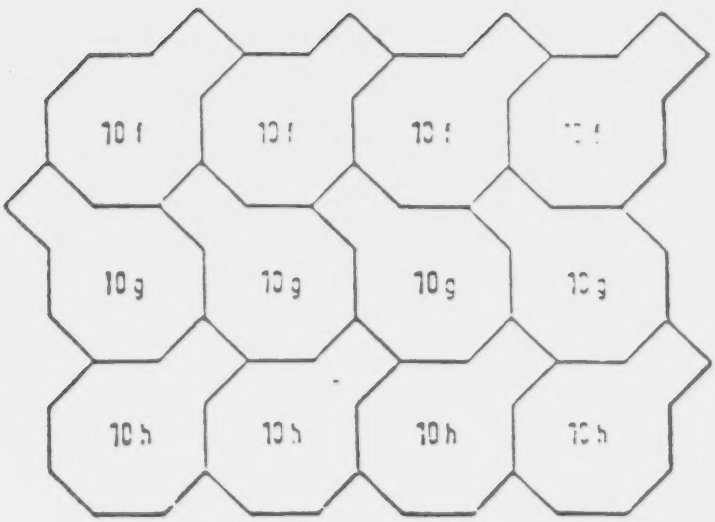


FIG. 6

EXHIBIT C

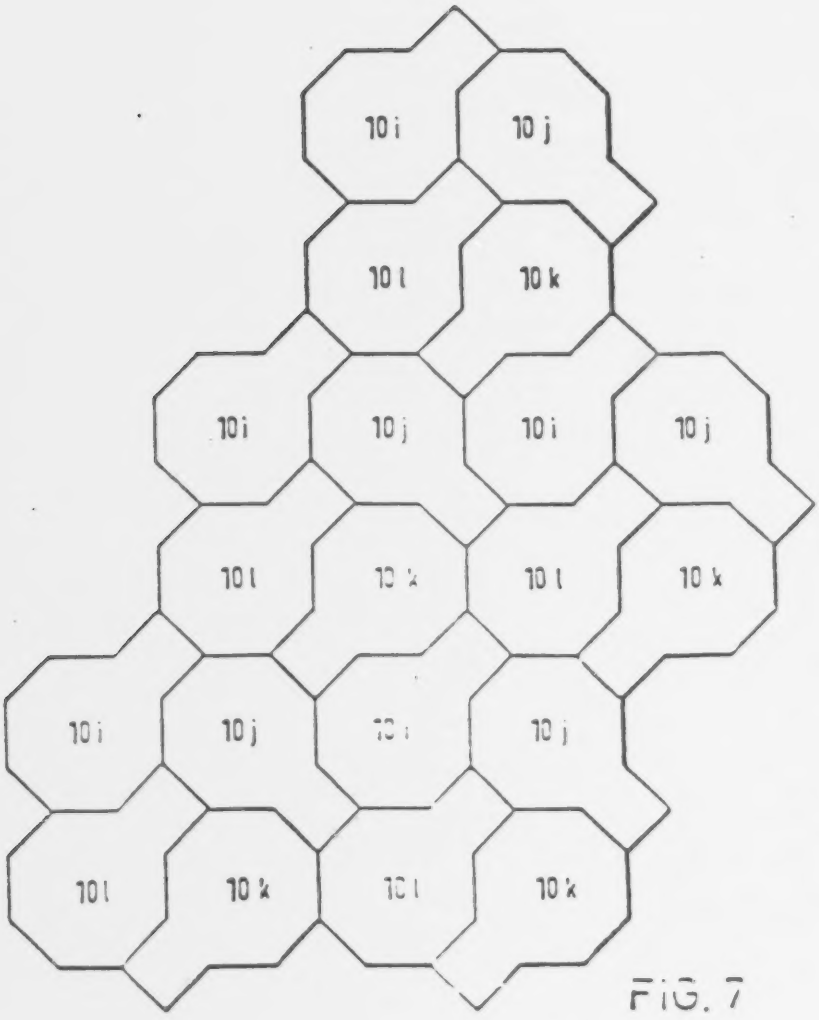


FIG. 7

EXHIBIT D

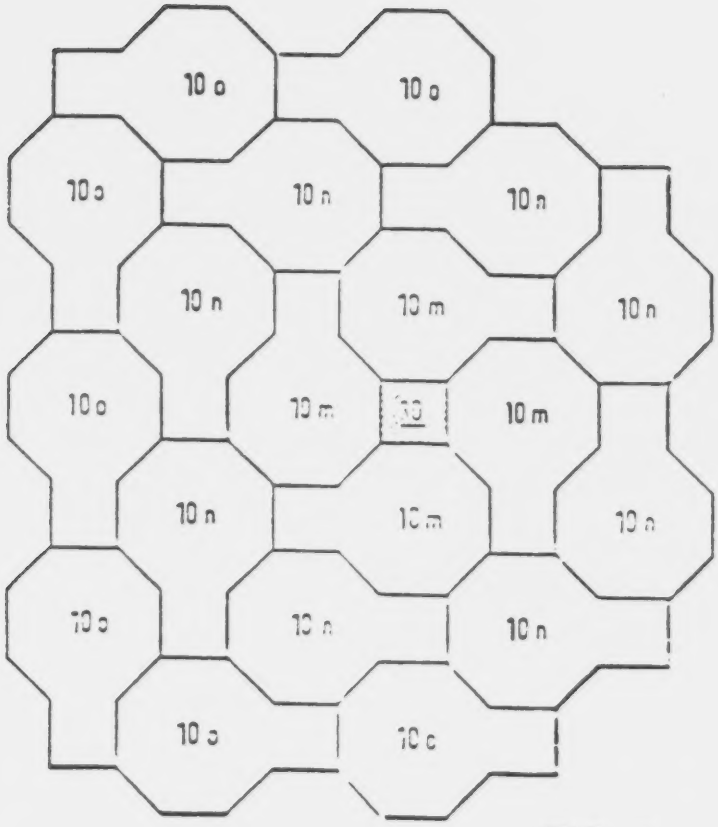
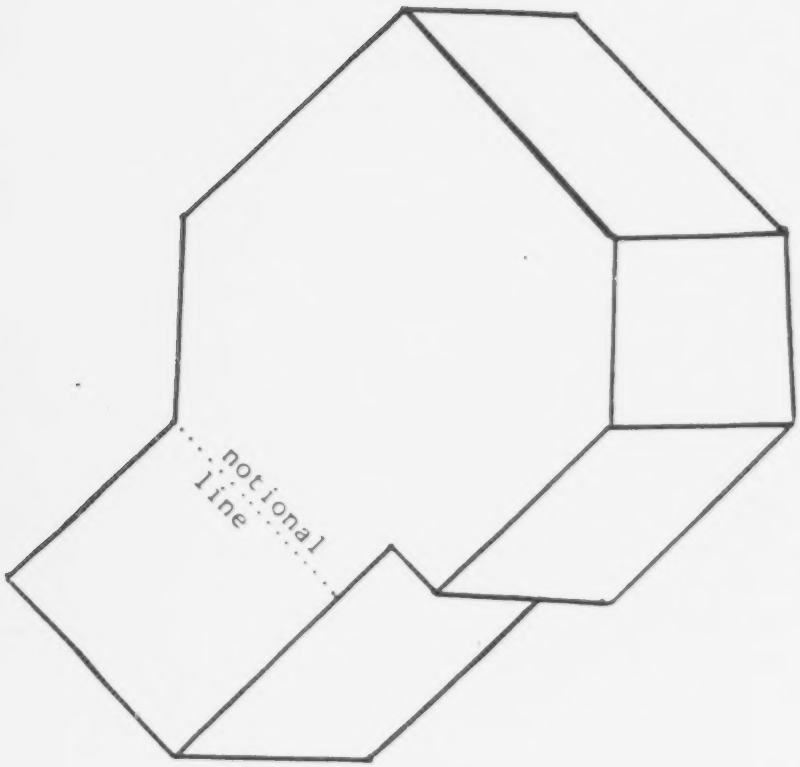


FIG. 8

EXHIBIT E



Geb. '249
(reproduced from plaintiffs' exhibit 15)

EXHIBIT F

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 4,128,357 Dated December 5, 1978

Inventor(s) Günter Barth and Fritz von Langsdorff

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

On The Title Page,
In the heading, directly beneath the line reading "[30] Foreign Application Priorty Date," insert -- Apr. 8, 1975 [DE] Fed. Rep. of Germany 2515210 --

Signed and Sealed this

Twenty-sixth Day of October 1982

Attest:

Ruth M. Hrouf

Attesting Officer

GERALD J. MOSSINGHOFF

Commissioner of Patents and Trademarks

United States Patent [19]

Barth et al.

[11] 4,128,357

[45] Dec. 5, 1978

[54] SLAB-ELEMENTS FOR COVERING THE GROUND

[76] Inventors: Günter Barth, 41 Grötzingen, 7500 Karlsruhe; Fritz Von Langsdorff, Blumenstrasse 12, 7551 Forch, über Rastatt, both of Fed. Rep. of Germany

[21] Appl. No.: 882,250

[22] Filed: Feb. 28, 1978

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 672,727, Apr. 1, 1976, abandoned.

[30] Foreign Application Priority Data

Mar. 25, 1977 [DE] Fed. Rep. of Germany 2713354
Mar. 29, 1976 [BE] Belgium 165663

[51] Int. Cl.² E01C 5/00
[52] U.S. Cl. 404/41; 52/608; D25/92
[58] Field of Search 404/41, 42, 22, 44, 404/38, 23, 39, 43, 24, 45, 34; 52/608, 604, 603, 590; D25/92, 93, 88

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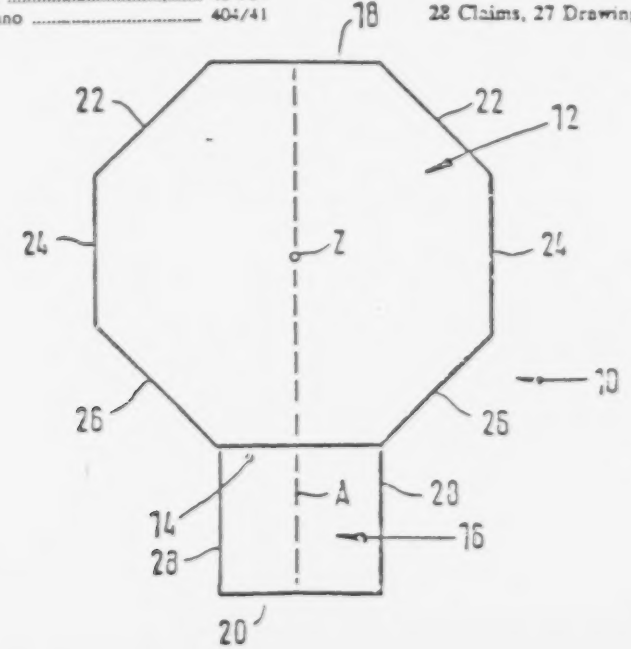
Primary Examiner—Nile C. Byers, Jr.
Attorney, Agent, or Firm—Albert C. Johnston

[57] ABSTRACT

A slab element for covering the ground is made e.g. of concrete and forms as a single piece. It has a head portion and a stem portion meeting at a notional meeting surface. The element is delimited by two opposite end faces of equal length joined by sides that form angled traces about a longitudinal axis common to the head at the stem, each said angled trace being formed by a succession of sides comprising at said head an inclined side face inclined in one direction relatively to the axis, a lateral side face extending lengthwise with respect to the axis and another inclined side face inclined in the opposite direction with respect to the axis, and comprising at the stem a lateral side face extending lengthwise with respect to the axis which is complementary to the lateral face of the head, the end face of the head together with its inclined sides and its lateral faces and the meeting surface describing a centrally symmetrical octagon, and the meeting surface together with the end face and lateral faces of the stem being symmetrical about the center of the stem. The head may describe a regular octagon. The stem may describe a square. But the stem may also describe a circle. The elements can be laid to form a composite ground covering structure, laid e.g. in herringbone bond pattern, and laid e.g. to include one or more supplementing slab elements of the same peripheral configuration as the stems of the elements.

28 Claims, 27 Drawing Figures



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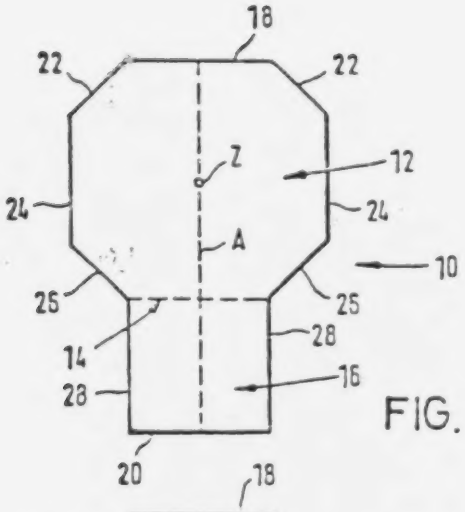
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FIG. 1

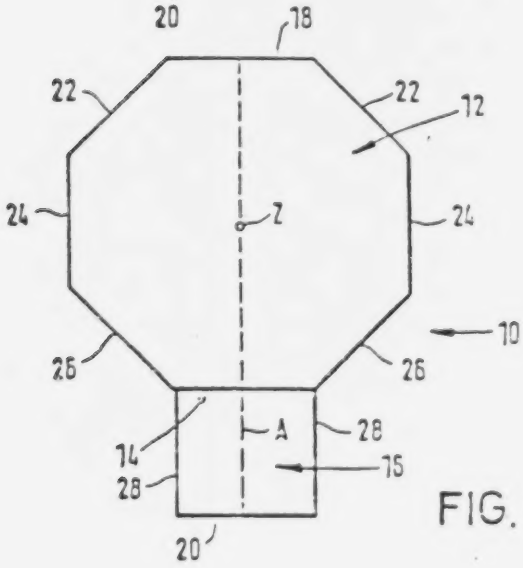
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FIG. 2

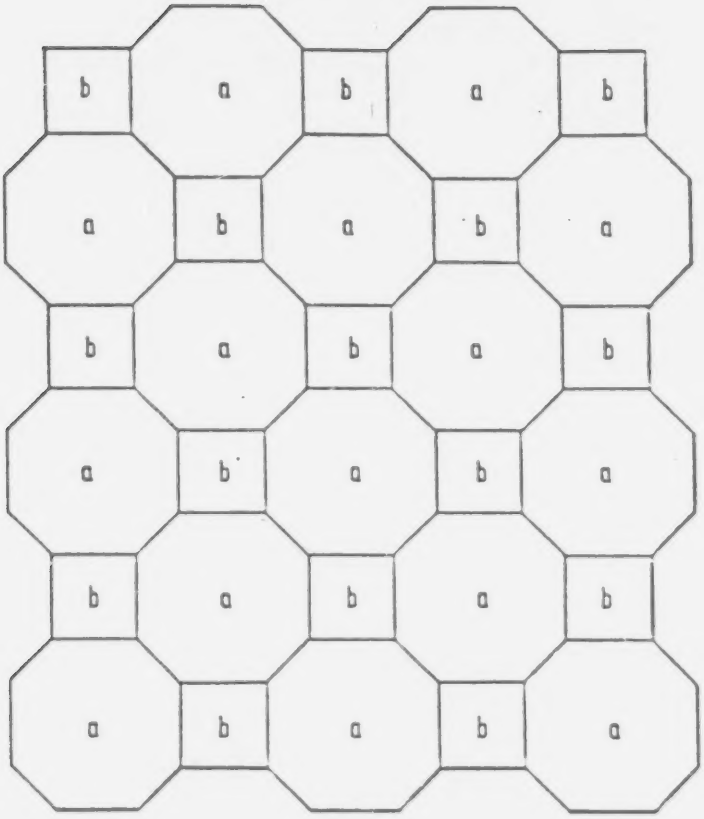

FIG. 2a

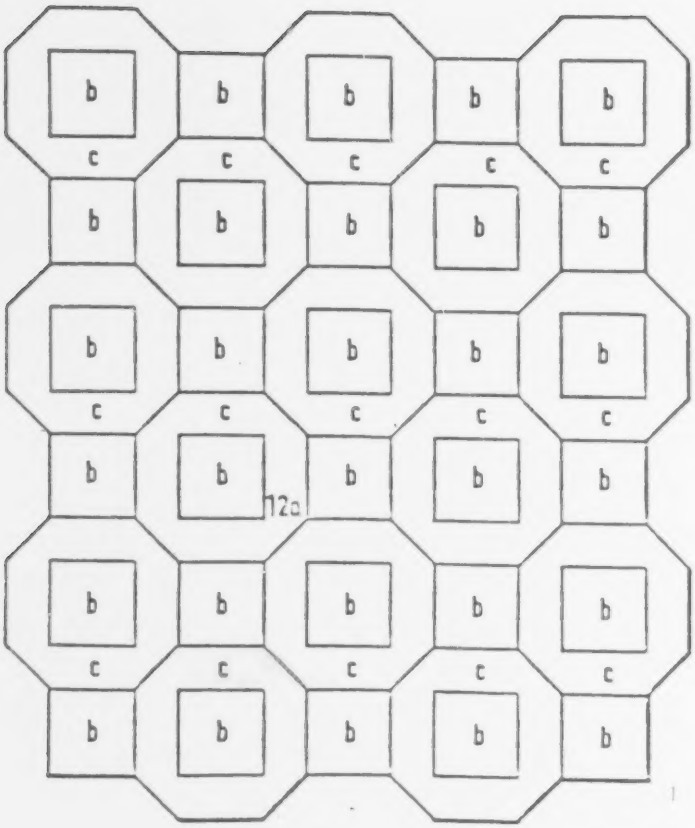

FIG. 2b

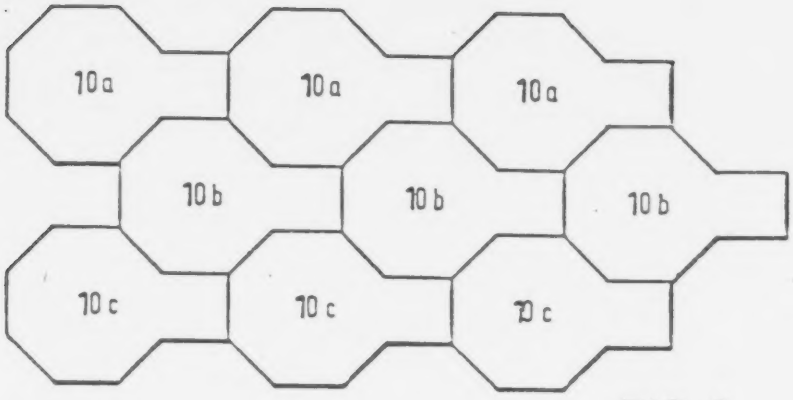
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FIG. 3

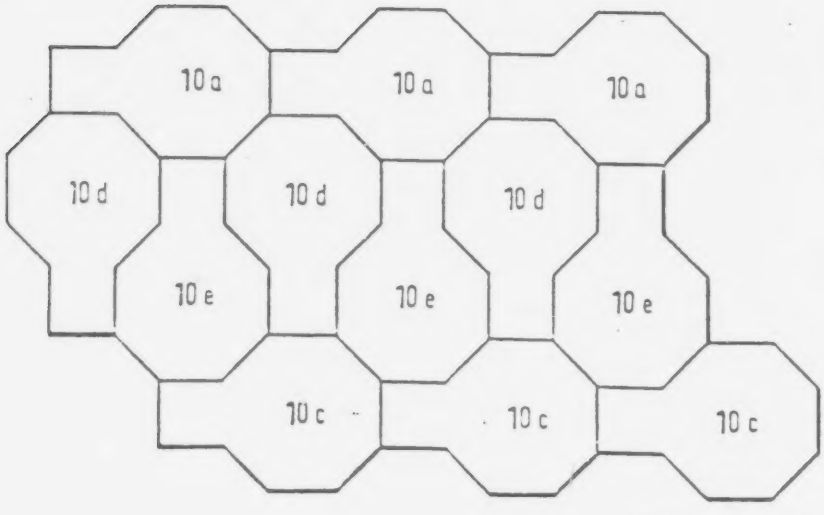
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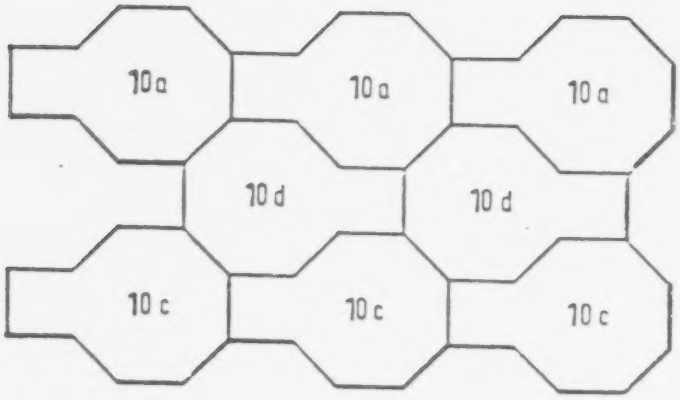
FIG. 4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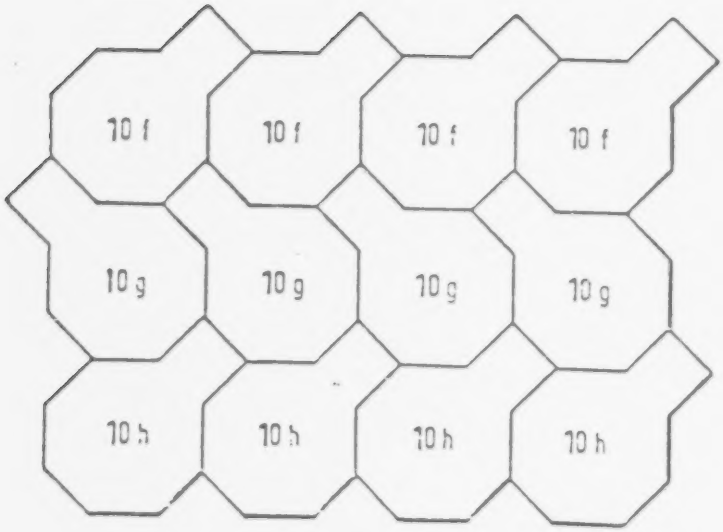
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FIG. 6

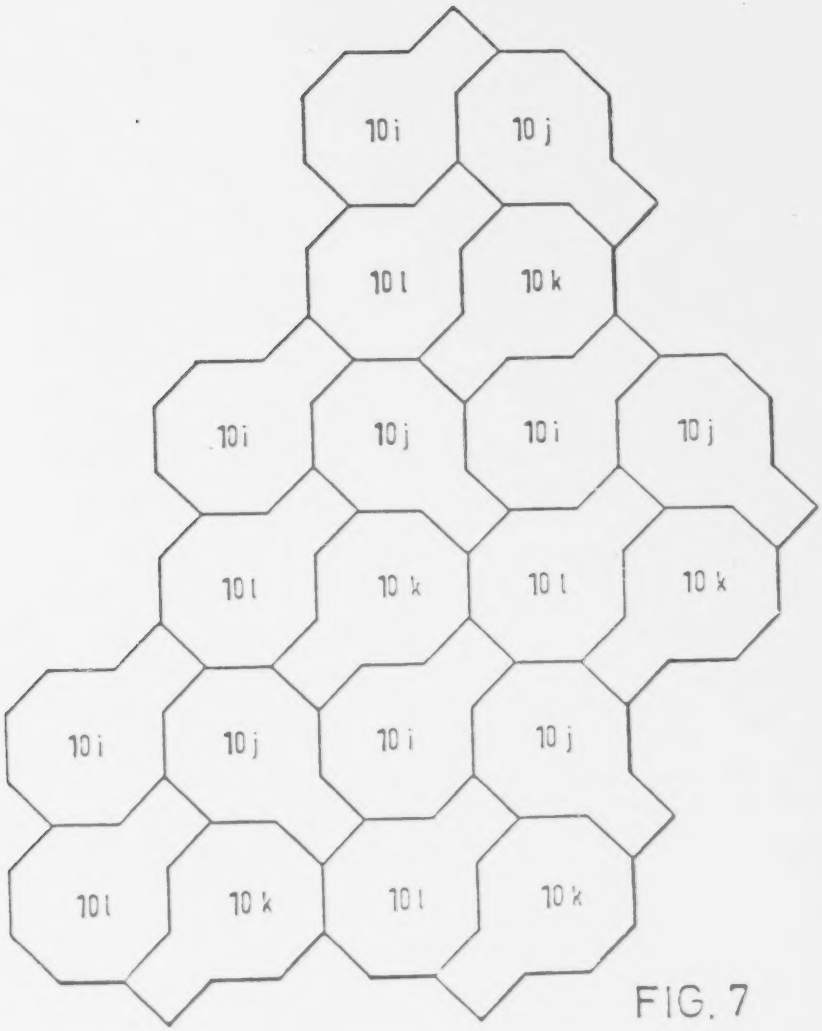
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FIG. 7

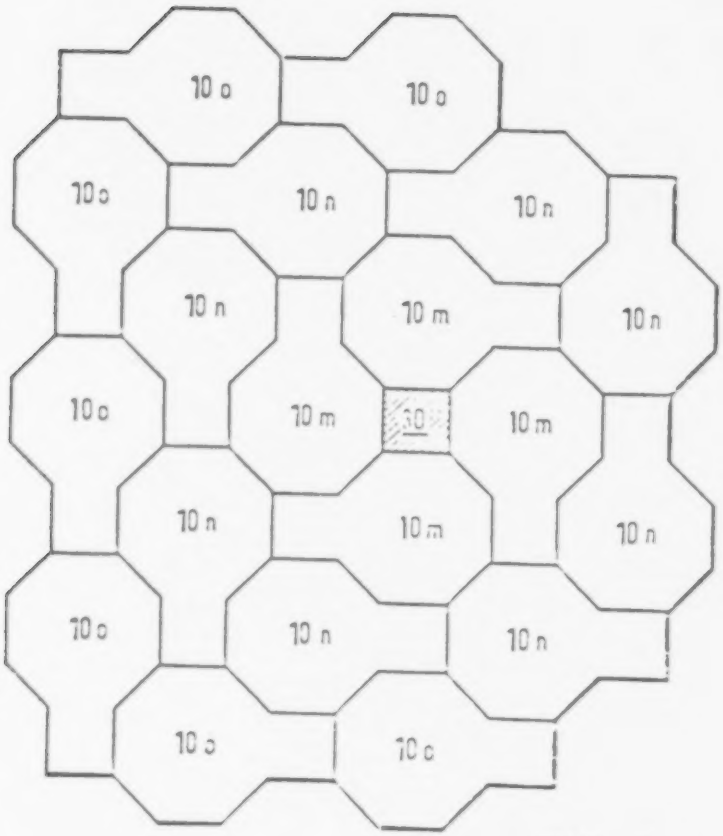
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FIG. 8

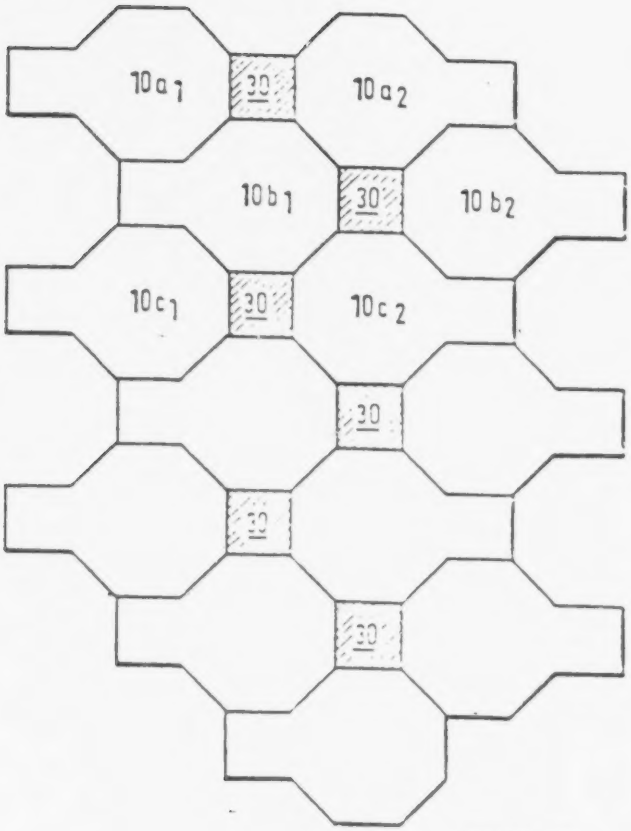


FIG. 9

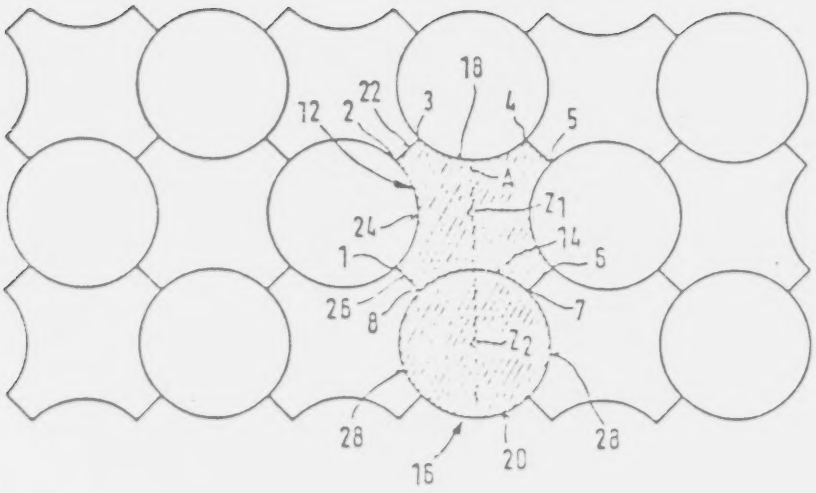
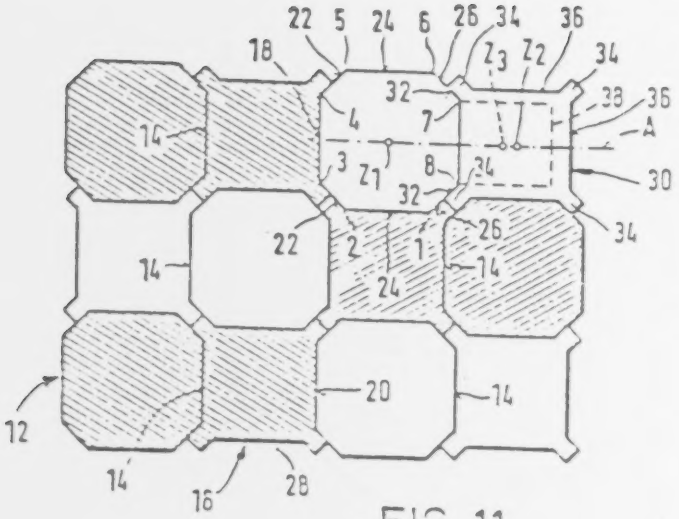


FIG. 10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Z_1
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FIG. 11

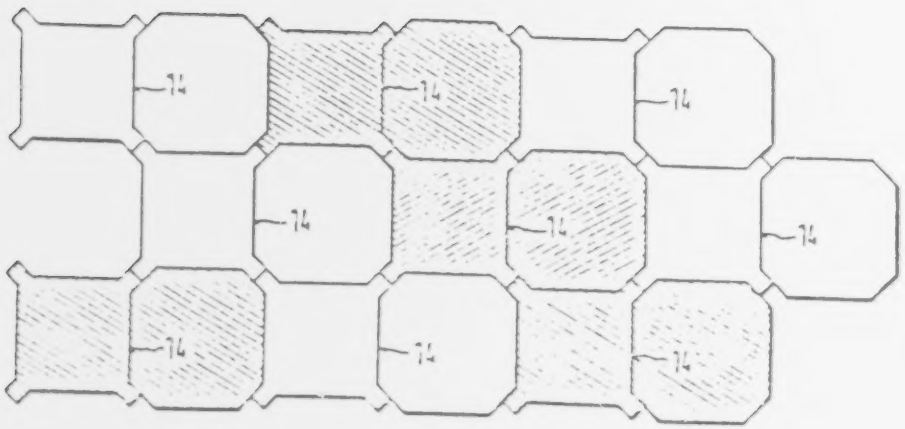
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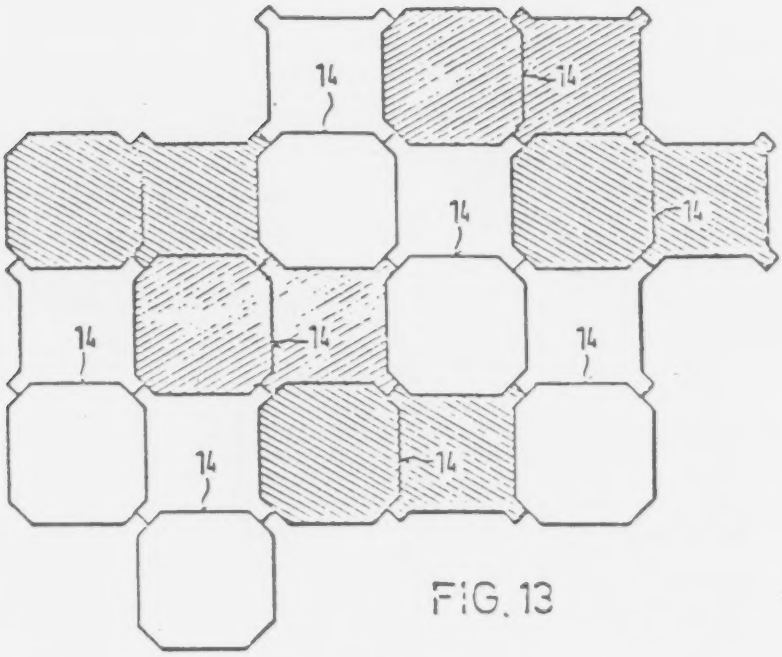
FIG. 12



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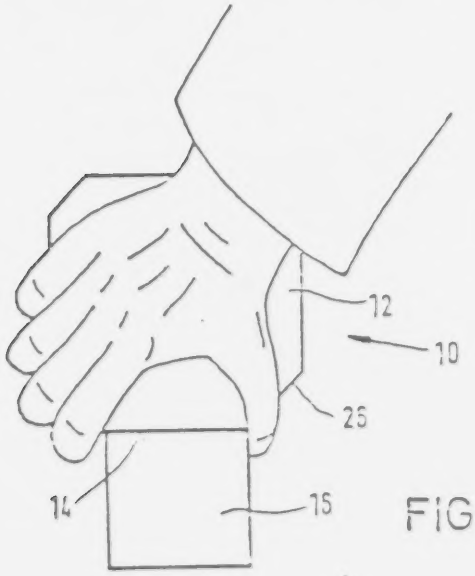


FIG. 14

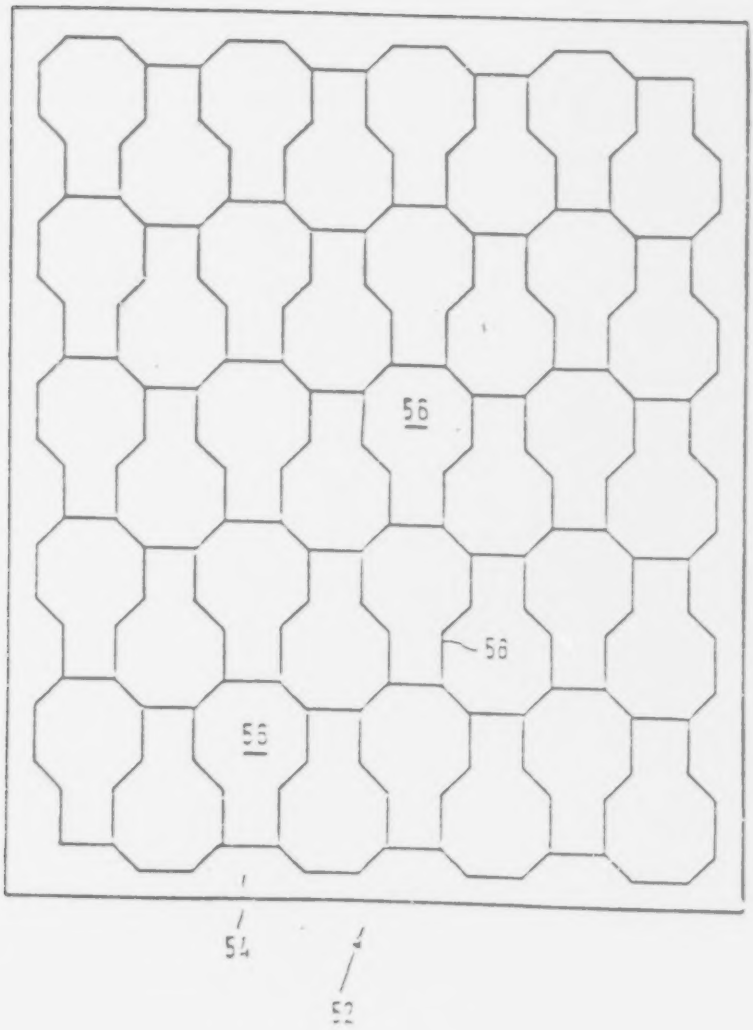
FIG. 17

FIG. 15

FIG. 16a

FIG. 16b

FIG. 16c



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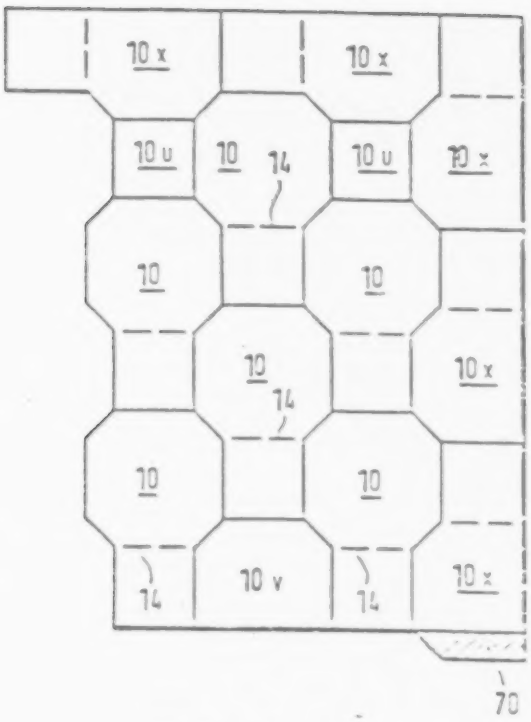

FIG. 19

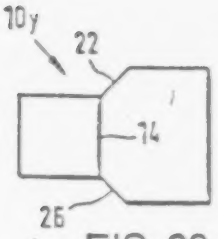

FIG. 20 d

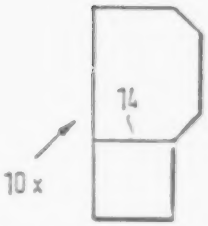

FIG. 20 c

FIG. 20 b

FIG. 20 a

SLAB-ELEMENTS FOR COVERING THE GROUND

This application is a continuation-in-part of Ser. No. 672,727 filed Apr. 1, 1976, and now abandoned.

BACKGROUND OF THE INVENTION

This invention relates to slab elements made of concrete for covering the ground. Such ground covering elements are used in the construction of traffic carrying surfaces, be it vehicular traffic or pedestrian traffic, for example roadways, squares, footways, entrance drives and the like, but if desired also in the construction of other ground covering structures such as embankments.

Many ground covering elements are known having properties that are satisfactory or even very good for forming ground covering composite structures, for example as regards resistance to breakage, interlocking and scope for laying different patterns. The criticism is however sometimes encountered that the pattern of the joints in a composite structure is not sufficiently stark or striking and that an incidentally desired decorative effect is not met or not fully met. This applies in particular if the pattern formed by the joints includes interengagement which decoratively is discordant. Admittedly there are also ground covering elements having contours that are more stark or striking in the composite structure, being in particular rectilinear; these however either afford a smaller choice of patterns they can form and/or they have less advantageous properties in the laid composite structure.

Thus the problem with which the invention is concerned is to provide a ground covering slab element that affords a good compromise between the wish for a good decorative effect on the part of the composite structure, desirable characteristics in the laid structure and large choice of laying patterns. The object of the invention is to provide an improved slab element which at least in some of its forms goes a good way to meeting that problem.

SUMMARY OF THE INVENTION

According to one of its aspects the invention provides a ground covering slab element formed as a single piece, said element having a head portion and a stem portion meeting at a dummy groove or dummy jointing gap allowing, but not necessitating, breakage of said slab element into head and stem along said dummy groove, said element being delimited by two opposite end faces of equal length joined by sides that form angled traces about a longitudinal axis common to said head and said stem, each said angled trace being formed by a succession of sides comprising at said head an inclined side face inclined in one direction relatively to said axis, a lateral side face extending lengthwise with respect to said axis and another inclined side face inclined in the opposite direction with respect to said axis, and comprising at said stem a lateral side face extending lengthwise with respect to said axis, said lateral face of said stem being complementary to said lateral face of said head, said end face of said head together with said inclined sides of said head and said lateral faces of said head and said meeting surface describing a centrally symmetrical octagon, and said dummy groove together with said end face of said stem and said lateral faces of said stem being symmetrical about the centre of said stem. Said end face of said stem, said lateral faces of said stem and said dummy groove together describe a square. Alternatively said end face of said stem, the lateral faces of said stem and said dummy groove merge without discontinuity and describe a circle.

Such elements, in at least some forms, whilst of a shape which in the composite structure looks striking, have no cross sectional constriction or seriously weakened cross section that is liable to rupture in the case of elements with square stems and none that are significant in the case of elements with circular stems; the corners are at least right angles or obtuse leading to lessened risk of breakage; there is a choice of several basically different laying patterns; and there is an absence of cross joints such as would adversely affect the cross linking in the composite structure.

The circular basic form of the stem, which is then also present at the sides of the head, can produce a clamp like interengagement in the composite structure when the stem of a slab element engages with the head of a neighbouring element.

Optimum combination of starkness of joint pattern and choice of laying patterns is obtained if each of said end faces, said inclined sides and said lateral faces, is rectilinear, and said head and said stem are mirror symmetrical about said longitudinal axis. However even here supplementary interengagement surfaces could be provided, particularly at the inclined sides of the head, in the form of alternating projections and recesses.

Preferably said inclined sides of said head are each shorter than said end face of said head. This provides balance of appearance with regard to the centre of gravity of the slab element and makes for ease of manipulation on laying. Also here the risk of rupture can be particularly low since the stem has a relatively large transverse dimension at the dummy groove. In an alternative construction however said end face of said head, said lateral faces of said head, said inclined sides of said head and said dummy groove together describe a regular octagon; this makes for a particularly high degree of symmetry and decorative effect. But it would be possible to make the inclined sides longer than the lateral faces of the head.

According to another of its aspects the invention provides a composite ground covering structure consisting of ground covering slab elements, said elements being laid to form a continuous covering, each said element being formed as a single piece, said element having a head portion and a stem portion meeting at a dummy groove of the type as specified above, said element being delimited by two opposite end faces of equal length joined by sides that form angled traces about a longitudinal axis common to said head and said stem, each said angled trace being formed by a succession of sides comprising at said head an inclined side face inclined in one direction relatively to said axis, a lateral side face extending lengthwise with respect to said axis and another inclined side face inclined in the opposite direction with respect to said axis, and comprising at said stem a lateral side face extending lengthwise with respect to said axis, said lateral face of said stem being complementary to said lateral face of said head, said end face of said head together with said inclined sides of said head and said lateral faces of said head and said dummy groove describing a centrally symmetrical octagon, and said dummy groove together with said end face of said stem and said lateral faces of said stem being symmetrical about the centre of said stem.

If decorative effect of the composite structure is regarded as particularly important the element may comprise differentiation means whereby said head is visually differentiated from said stem, so that a composite structure composed of identical said elements gives the appearance of consisting of non-identical elements. In addition to the dummy joints which are provided at the location of the meeting surface (which may constitute a predetermined rupture zone although not necessarily provided for this purpose but at least to provide the illusion in the decorative effect of independently laid head and stem elements), visual differentiation may be produced by a difference in height, surface texture (e.g. change over to smooth or tailings concrete) and/or coloration. In this way the elements can be used to produce the appearance of two ground covering slab elements of different contour as though laid independently in Roman pattern. In the Roman pattern octagonal elements are laid in conjunction with square elements. Compared to the latter, a composite structure laid with the elements embodying the invention exhibits at least equivalent or even better cross bonding resulting from its peripheral shape which is non central and non rectangular. This applies also to slab elements in which the head and stem are mirror-symmetrical with respect to the longitudinal axis and the end faces, inclined sides and lateral faces are all rectilinear; though devoid of engagement surfaces they can be laid in herringbone bond pattern which is advantageous in that it makes for a particularly well interlocked composite structure and indeed constitutes a preferred form of laying elements embodying the invention.

Whether laid in herringbone pattern or in a different pattern, the surfaces of different element groups may be visually different e.g. by being of different coloring. A particularly effective bond pattern can be formed by incorporating in said structure at least one supplementing slab element, said at least one supplementing element having the same peripheral configuration as said stems of said elements. Such supplemental slap elements may be conventional square building stones or rectangular blocks, commonly available in commerce, preferably of a visually different or contrasting surface appearance, to mark a centre of a composite structure or a zone intended to be emphasized.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a plan view of a first ground covering slab element,

FIG. 2 shows in plan an alternative second slab element,

FIG. 2*a* illustrates in top plan a composite structure comprising ground covering elements according to FIG. 2,

FIG. 2*b* depicts in top plan a composite structure comprising ground covering elements according to FIG. 2, having a supplementary square dummy joint in the centre of the head,

FIGS. 3 to 7 show composite structures comprising ground covering elements without the use of supplementing elements,

FIGS. 3 and 9 show composite structures comprising ground covering elements incorporating at least one supplementing element,

FIG. 10 is a plan view of an alternative ground covering element, in one of the several possible bond patterns,

FIGS. 11 to 13 show three different composite paving structures, in the case of FIG. 13 an ordinary herringbone pattern, incorporating still another ground covering element, with adjacent elements interlocking as in the example of FIG. 10,

FIG. 14 is an illustration of a preferred dimension and surface distribution of a ground covering element to be gripped by only one hand of an operator,

FIG. 15 shows a top view of the slab element of FIG. 1, but chamfered at the top edge,

FIG. 16*a* shows a vertical section of the element of FIG. 15 along line S—S in FIG. 15,

FIG. 16*b* shows the detail of the dummy groove encircled in FIG. 16*a* on a larger scale,

FIG. 16*c* shows the connecting area of two adjacent elements of FIG. 15 on the same scale as FIG. 16*b*,

FIG. 17 shows a vertical sectional view of a mold for manufacturing the slab element of FIG. 15,

FIG. 18 is a top view of a mold frame for use in the mold of FIG. 17,

FIG. 19 shows a composite structure using elements as shown in FIG. 1 or FIG. 15, respectively, and including additional edge stones,

FIGS. 20*a* and 20*b* show two edge stones of conventional type, and

FIGS. 20*c* and 20*d* show two new edge stones for alternative use, integrally but separatably composed of two partial elements corresponding to the single elements of FIGS. 20*a* and 20*b*, respectively.

DESCRIPTION OF PREFERRED EMBODIMENTS

Each of the two alternative ground covering slab elements 10 shown in FIGS. 1 and 2 has a head portion or head 12 and a narrower shank portion or stem 16 made in one piece with the head meeting the stem along a dummy groove 14. The head 12 and the stem 16 are mirror-symmetrical relative to an imaginary common longitudinal axis A shown in broken line. The head 12 provides a first end face 18 and the stem 16 an opposite end face 20 of the ground covering element 10. The end faces 18 and 20 have the same length, extend rectilinearly normal to the axis A and, due to the mirror-symmetry relative to the axis A, are bisected by the latter. The connecting plane 14 of the head and the stem extends parallel to the two end faces 18 and 20 and has the same length as the latter.

At both sides of the axis A, the extremities of the two end faces 18 and 20 are joined by sides forming angled or polygonal traces. Adjacent each extremity of the end face 18 of the head there follow in succession an inclined side face or lateral face 22 inclined at 45° relative to the axis A, a lateral side face 24 parallel with the axis A, and another inclined side face or lateral face 26 inclined at 45° in the opposite sense relative to the axis A, these faces laterally delimiting the head 12. The inclined lateral face 26 of the head and the end face 20 of the stem 16 are joined by a lateral side face 28, parallel to the axis A, of the stem 16. All these faces are rectilinear.

The polygonal trace connecting the two end faces 18 and 20 of the ground covering element 12 and describing the side of the ground covering element, thus comprises (one after the other) the lateral faces 22, 24, 26 and 28. Since the stem 16 is dimensioned to be narrower than the head 12, the lateral face 28 parallel with the axis of the stem 16 is positioned to be nearer than the lateral face 24 parallel to the axis of the head 12, the lateral face 28 of the stem however is of the same length as the lateral face 24 of the head.

The end face 18 of the head, its two lateral faces 22 inclined relative to the axis A, its two lateral faces 24 parallel with the axis, and its two lateral faces 26 inclined in the opposite sense, relative to the axis A, describe together with the dummy groove 14 of the head 12 and the stem 16 an octagon which is centrally-symmetrical relative to the centre Z. The centre Z is located on the axis A. Due to the symmetry described, the lengths of the faces of the head 12 are at most two in number. Identical with each other are, first of all, the end face 18 of the head, the two lateral faces 24 thereof parallel to the axis A, and also the connecting face 14 thereof with the stem. Furthermore, the four lateral faces 22 and 26 inclined relative to the axis A of the head exhibit lengths which are identical with each other but which can if desired differ from the first-mentioned faces.

The embodiment of FIG. 1 differs from the embodiment of FIG. 2 with regard to the outer peripheral shape merely in that in the case of the embodiment of FIG. 1 the lateral faces 22 and 26 inclined relative to the axis A are shorter than the end face 18 which is of the same length as the axis-parallel lateral faces of the head, whereas in the case of the embodiment FIG. 2 all the delimiting faces of the head are identical with each other, thereby describing a regular octagon. The embodiment of FIG. 1 exhibits preferred dimensioning of the length of the inclined lateral faces 22 and 26 of the head relative to the end face 18 thereof, in the ratio of 1:2 or better between and 3:4 or, preferably, between 1 and 2:3.

In the case of both embodiments, the stem 16 describes a square delimited by the end face 20 of the stem, the two lateral faces 23 thereof and the connecting face 14 of stem 16 and head 12.

The head and the stem are a common massive concrete shaped member. The dummy groove 14 between the head 12 and the stem 16 not only sets off, i.e. visually differentiates the surface of the head 12 and of the stem 16 from each other — and in the composite structure gives the impression that the composite structure is laid not with integral ground covering elements of a single shape comprising head 12 and stem 16, but is laid with individual octagonal and square elements separately from each other — but also defines a predetermined rupture zone allowing, but not necessitating, breakage. In addition to the dummy groove 14, some other visual suface differentiation of head and stem may be provided.

The ground covering element of FIGS. 1 and 2 is shown merely in plan view. It will be understood that it can be dimensioned in the vertical direction in known manner, for example with a chamfer at the peripherally extending upper edge, or even with vertical engagement. However vertical lateral faces are greatly preferred possibly ending in chamferlike oblique surfaces.

Preferred is also the rectilinear configuration shown, which in the case of lateral faces as described, then results in having plane lateral faces. If limitations are acceptable with regard to the choice of laying patterns (described below), recesses can be provided in the periphery of the head at least at the lateral faces 22 and 26 inclined relative to the axis A, to provide for supplementary engagement in the composite structure.

FIGS 3 to 7 show various composite structures made up of ground covering elements 10 of the basic construction described with reference to FIGS 1 and 2. In all the composite structures if desired for the decorative effect, each of the individual ground covering elements 10 is provided with a dummy joint or dummy groove 14 at the connecting face of head and stem as in FIG. 2. This results, in the case of all the different bond patterns described below, in giving the impression illustrated in FIG. 2*a* that a Roman bond is made up on the one hand from octagonal ground covering elements *a* and on the other hand from square ground covering elements *b* which, in the case of all the composite structures, appear to be applied at the lateral faces parallel or normal to the axis A, whereas the octagons are located opposite each other only by abutment at the inclined lateral faces. In FIG. 2*a*, it is no longer possible to recognize which element b belongs, as stem 16, to which element a as head 12 of the same ground covering element 10, since the actual joints between different ground covering elements 10 and the dummy joints in the case of the same ground covering element have identical appearance, at least at first glance.

FIG. 2*b* shows a further development of the basic idea of FIG. 2*a*, whereby optical surface differentiation is provided in the case of identical ground covering elements, thereby producing, when laying the elements in the composite strucutre, the optical impression of an apparent Roman bond comprising nonidentical elements, like the elements a and b of FIG. 2*a*. In the composite structure of FIG. 2*b*, ground covering elements 10 are laid which are further developed relative to FIG. 2, in which in addition to the rectilinear dummy joint between the head 12 and the stem 16, a further dummy joint 12*a* is provided of the same area as the stem 16 and concentric with the top surface of the head 12, some of the sides of the dummy joint 12*a* being arranged parallel and some at right angles to the periphery of the stem 16. Thereby, in the example illustrated, the illusion is given of an externally octagonal ring component *c* having a square recess, and supplemented partly at the sides as in the case of element a of FIG. 2*a* and partly in the square recess, by unlike elements b.

In the case of a possible variant (not illustrated), also the elements b laterally adjacent the imaginary ring component c and the elements apparently inserted in the ring components c may have varying lateral length, and even varying peripheral shape. With this example, the possibilities for advantageous visual surface differentiation of identical ground covering elements 10 are not exhausted. A description will now be given of the various alternative specific patterns for laying the ground covering elements 10 (as distinct from the visually illusory effects), wherein the visual surface differentiation possibilities according to FIGS. 2*a* and 2*b* are additionally possible.

The composite structure according to FIG. 3 shows the simplest pattern of laying the elements 10*a*, 10*b*, 10*c*, etc. which as regards the alignment of head and stem are all identically oriented and follow one after the other in partially aligned rows designated by the suffixes a, b and c to reference numeral 10 of the ground covering element and furthermore emphasized by framing in thicker line. In the actual composite structure, of course, there is no visual difference between the joints formed between the individual rows and the joints between the stem of one and the head of a following ground covering element, unless it be desired expressly to emphasize such a difference, for example by arranging a chamfer only at one of these joint types.

The embodiment of FIG. 5 differs from that of FIG. 3 only in that the orientation axis of head and stem is

rotated through 180° at each alternate row. Thus, there follows here one upon the other the rows of ground covering elements 10 indicated by suffixes a, d and c, and in the case of FIG. 3 the rows distinguished by suffixes a and c have the same orientation of head and stem, whereas in an interposed row (here row d), this orientation is reversed, through 180°. Thus, a row of one orientation here always follows a row of a reverse orientation. Whereas in the composite structures of FIGS. 3 and 5, in each case a side of the head of a ground covering element fits into the niche formed at the stem of the ground covering element following in the next row, FIG. 4 provides an alternative in which it is not the side of the head but the endface thereof which fits into that niche.

Again, in the case of the composite structure of FIG. 4, two rows (designated a and c) of composite structure elements are laid with the same orientation of head and stem. Arranged between them are pairs of composite elements rotated through 90° relative to the direction in which the rows a and c extend, the elements of each pair being rotated in opposite directions. The two elements following each other alternately in this intermediate row are identified by the suffixes d and e. Here, the end faces of the stems of the elements 10 having suffixes d and e are located adjacent a lateral face, parallel to the axis A, of the elements 10 in the rows c and a respectively. In the composite structure of FIG. 4, a visually particularly desirable appearance can be achieved if the elements of one row, for example the elements of row a, are designed to be visually identical with the elements e of adjacent rows and optically different relative to the remaining elements d of adjacent rows, so that then a continuous row is obtained having arms projecting like pins on both sides, consisting of elements 10e whereof the end-faces are at the axis-parallel lateral faces of the heads of the ground covering elements 10a.

A further laying pattern which is preferred because of the uniformity of appearance and good bonding properties, is the herringbone bond of elements 10 of FIG. 6.

In this case, there is again alternating orientation of ground covering elements 10 following one upon the other in rows f, g and h. However, in contrast with the rows a and c of FIGS. 3 to 5, in this case the ground covering elements are not aligned axially with each other but are arranged at an angle of 90° in such manner that the axis-parallel lateral faces of the head are in each case located oppositely, on one side of the axis, with the axis-parallel lateral face of the stem of the ground covering element following in the same row and on the other side of the end face of the stem of the ground covering element following in the next row. With this arrangement, the axes of the invidiual ground covering elements of successive rows are inclined alternately positively or negatively with respect to the direction in which the rows follow each other.

Relative to this direction in which the rows follow each other, the alignment of the stems of the rows f, g and h in the case of the herringbone structure of FIG. 6, is always of like sense albeit alternately inclined through an angle of 45°.

Finally, FIG. 7 shows a variant devoid of such a preference direction with regard to a series of successive floor covering elements.

In this case, there are in each particular instance four ground covering elements 10i, 10j, 10k and 10l assembled clockwise about a centre, and the composite structure continues in such groups of four.

As in the case of the individual rows of FIGS. 3 to 6, here the individual groups are rendered visible by thickened peripheral marking, but here again this group-wise combination need not necessarily be the result of the joint system of the composite structure. However, here again the elements assembled group-wise may be designed to provide for visual differentiation, for example by coloration.

It will be seen that in the composite structure of FIG. 7 all the possibilities for connecting composite elements such as are shown in FIGS. 3 to 6 are combined. Thus, in groups following one after the other the elements 10i and 10l of FIG. 7 and also the elements 10a of FIG. 3 and the elements 10i and 10l and elements 10f in FIG. 6 follow each other; within each group, the elements 10l and 10j and also the elements 10d and 10e in FIG. 4, the elements 10j and 10k and also the elements 10d and 10a in FIG. 4 and the elements 10l and 10k and also the elements 10a and 10d in FIG. 5 follow each other.

Finally, FIGS. 8 and 9 show composite structures wherein generally available square supplementing elements, such as square slabs or paving stones, can additionally be included in the composite structure. Such supplementing stones 30 are clearly indicated relative to the composite elements 10 by hatching in FIGS. 8 and 9. However, their surface appearance need not necessarily differ. However, such different surface appearance is frequently desired for example for making purposes.

In the case of the composite structure according to FIG. 8, a single supplementing stone 30 constitutes a centre of the composite structure about which the composite structure elements 10 are laid to form turns with predetermined rotational clockwise or anti-clockwise direction. The individual turns are designated m, n and o. It will be seen that in the case of the particular composite structure illustrated, the clockwise or anti-clockwise direction of stem alignment of the ground covering elements alternates in turn m relative to that of turn n, whereas the anti-clockwise or clockwise direction of turns n and o is identical. The selection of anti-clockwise or clockwise direction can be freely chosen in each particular instance.

In the case of the composite structure of FIG. 9, two partial composite structures according to FIG. 3, wherein three successive rows are again designated a, b and c and exhibit opposite stem orientation (indicated by varying suffixes 1 and 2) confront each other at the end faces, supplementing stones 30 being interposed between the end faces of confronting composite structure elements of the two partial composite structures according to FIG. 3. These supplementing stones extend in two neighbouring lines, so that each supplementing stone additionally passes into abutment at the axis-parallel sides of ground covering elements of neighbouring rows of the same partial composite structure. Thereby, each line can be regarded as associated with one partial composite structure.

Further details of the association of the individual end faces and lateral faces of the composite structure elements 10 in all the bonds shown according to FIGS. 3 to 9 will readily be apparent to the person skilled in the art from what is shown in FIGS. 3 to 9, to which reference is expressly directed.

It is also self-evident that the bonds shown and described can be continued in identical fashion in all directions.

A corresponding choice of several laying patterns is also possible in the case of the alternative ground covering element shown in the composite structure of FIG. 10 and there emphasized by hatching. That element has a circular stem 16 and a wider octagonal head 12. In the embodiment shown, the head and stem have a meeting surface designed again as dummy groove 14 of the type specified earlier along a quarter-periphery of the stem, whereas the free stem periphery forms, as a continuous arc of a circle, the two lateral stem faces 28 and the end face 20, it will be seen from FIG. 10 that the merging lateral and end faces 20 and 28 are distinguished from each other in the composite structure in that they abut with different, adjacent ground covering elements. The end face 20 of the stem 16 if translated along the mirror-image axis A of the ground covering element 10, conforms to the second end face 18 thereof at the head 12, describing a quarter-circle arc with the stem diameter; to the lateral faces 22, 24 and 26 of the head 12 of the embodiments according to FIGS. 1 to 9, there here correspond lateral faces of identical numbering. With this arrangement, the lateral faces 22 and 26 are of rectilinear design and are obliquely disposed relative to the axis A at angles of 45° and to each other at angles of 90°. The circularly scooped out lateral faces 24 extend lengthwise with respect to the axis A and are complementary to and of the same length as the end faces 18 and 20 of the ground covering element, whereas the lateral faces 22 and 26 are shorter. So here the angled trace extending from the end face 18 of the head to the end face 20 of the stem, is made up partly of part circular sections and partly of rectilinear sections. Supplementary interengagement parts could be added to the basic forms shown, as in the case of FIGS. 1 to 9. The entire ground covering element is mirror-symmetrical relative to axis A and additionally the head 12 is centrally symmetrical relative to its centre Z and the stem 16 is centrally symmetrical relative to the circle centre point (not shown). As regards the possible composite structures illustrated in FIGS. 8 and 9, instead of the square supplementing stones 30, circular ones would be used.

It is not essential that the arcuate connecting face 14, the end-face sides 18 and 20 of the ground covering element 10 and also the two lateral faces 24 of the head 12 thereof should describe a quarter-circle arc of the stem: it is for example also possible for the end-face 18, the two lateral faces 24 and the end-face 20 to have a centre angle smaller than 90° or, alternatively, that the said centre angle should also be somewhat greater than 90°. In the former case, the centre angle may for example be 45°, so that the arc length of the arc formed by the said lateral faces is an eighth of the full circle periphery and, then, the chord of the dummy groove 14 and also of the end face 18 and of the lateral faces 24 of the head have the same length as the lateral faces 22 and 26 of the head 12 and describe therewith a uniform octagon.

Also in the case of the embodiment of FIG. 10, the head 12 and the stem 14 are expediently visually differentiated from each other along the line 14 by a dummy joint and, if desired, additionally by other known visual means so that the head and the stem of the ground covering element appear to be independent separate central-symmetrical laying elements.

In the composite structures according to FIGS. 11 to 23 the individual ground covering slabs are characterized in part by uniform oblique hatching and in part by leaving out the hatching.

In analogy to the embodiment according to FIG. 11 the following applies: Each ground covering slab element has a head 12 and a narrower stem or foot 16. The head is centrosymmetrical with respect to its center Z_1, while the foot is centrosymmetrical with respect to its center Z_2. Furthermore, head and foot which are integrally joined are mirror symmetrical with respect to their central axis A passing through the two centers Z_1 and Z_2.

Head 12 describes an octagon having eight corners 1 to 8. In the embodiment shown the delimiting lines extending longitudinally and transversely of the central axis A, namely delimiting line 18 at the face end of the head between corners 3 and 4 and delimiting lines 24 at either longitudinal side of the head between corners 1 and 2 and 5 and 6, respectively, are longer than delimiting lines 22 between corners 2 and 3 and 4 and 5, respectively. The same applies mutatis mutandis to the other delimiting lines of the centrosymmetrical head. However, it is also possible for all the delimiting lines mentioned of the centrosymmetrical head to be of the same length, and it is even possible for delimiting lines 22 to be longer than delimiting lines 18 and 24, if desired.

Head 12 which is centrally symmetrical in itself and foot 16 which is likewise centrally symmetrical in itself meet each other along a dummy groove 14 at the top side of the slab element. The dummy groove allows but does not necessitate breakage of the slab element into head and stem or foot along its length. In addition, head and foot may be visually different, such as by a difference in coloration, roughness, e.g. different structure or kind of material, or height.

Dummy groove 14 extends between corners 7 and 8 and in part also between corners 1 and 8 and 6 and 7 of the octagon circumscribing head 12.

In FIG. 11 inamaginary square 38 having a center Z_3 is shown in broken lines within foot 16 and starting from corners 7 and 8. The center Z_3 is located closer to the head than center Z_2 of foot 16.

It can been seen in FIG. 11 that the indentation line of the foot extends entirely outside of the sides of the imaginary square. As compared to that the imaginary octagon circumscribing the basic format of the head coincides with the practical octagon between corners 1 to 8 which are formed outside of the area taken up by foot 16 by straight delimiting lines 26 (half the side between corners 6 and 7 as well as 1 and 8, joining corners 6 and 1, respectively.), 24, 22, 18, 22, 24, and again 26.

The indentation line designated 30 at foot 16 and the side halves 32 of the octagon between corners 6 and 7 and 8 and 1, respectively, and starting from corners 7 and 8 each define a square 34 from the outside along three sides. Corresponding squares 34 are to be found at the outer corners of foot 16 in central symmetry with respect to center Z_2. Between the defined squares 34 indentation line 30 of the foot extends along straight lines 36 which run parallel with the sides of the imaginary square 38. The straight lines 36 circumscribe a square, the center of which is Z_2 which is offset with respect to center Z_3 of the imaginary square and from the corners of which the defined squares 34 project at angles of 45° and in mirror symmetry with respect to the angle bisector.

Straight lines 36 at the sides 23 of foot 16 and at the end face 20 thereof cover the same length as end face 18 of the head between corners 3 and 4 and the delimiting lines 24 of the same length between corners 5 and 6 as well as 1 and 2. The length of the edges of the defined square 34 corresponds to half the length of the inclined faces of the head between corners 6 and 7, 1 and 8, 2 and 3, as well as 4 and 5.

With this arrangement indentation line 30 of the foot constitutes one projection each at each side of the foot, caused by a corner of the defined square 34, and an intermediate recess or indentation. This indentation is very much extended and its straight bottom practically has no notching effect on the foot.

FIGS. 11 to 13 show a selection of three different composite structures of a number of further possible composite structures of the ground covering slab element.

In the two composite structures according to FIGS. 11 and 12 the individual rows of the ground covering elements extend side by side so that the end face each of the head 12 of a ground covering element is placed adjacent the end face 20 of the foot of the next successive ground covering element in the same row. Besides, in adjacent rows each the longitudinal side 24 of a head 12 abuts the longitudinal side 23 of the foot of the adjacent ground covering element.

The composite structures according to FIGS. 11 and 12 differ in that with the structure shown in FIG. 11 the heads are directed alternatingly to the left and right, as seen in the drawing, so that in adjacent rows two ground covering element each are placed fully adjacent one another, whereas with the arrangement according to FIG. 12 the orientation of the heads in the individual rows is the same so that the ground covering elements each are offset by one half.

The two composite structures according to FIGS. 11 and 12, however, do not yet fully exploit all the possibilities of the ground covering element. This is done in the composite structure of FIG. 13 only in which not only the possibility of joining or the attachability of the longitudinal sides 24 of head 12 to the longitudinal sides 23 of foot 16 is realized but also the possibility of joining or the attachability of the head-end end face 18 of the ground covering element to the longitudinal side 23 of foot 16 as well as the foot-end end face 20 of the ground covering element to the longitudinal side 24 of head 12.

In FIGS. 11 to 13 the connection between head and foot in a single ground covering slab element is shown by the respective dummy groove 14 which joins head and foot.

It is a matter of course that the possibility of joining the longitudinal sides of the head to the longitudinal sides of the foot and of the head-end end face to the longitudinal side of the foot as well as of the foot-end end face to the longitudinal side of the head is warranted not only by the sections of the delimiting line marked by reference numerals but must be guaranteed on the whole in the composite structure. Within the framework of a square network pattern corresponding rhythms of the delimiting lines must be repetitive in the entire composite structure. Yet it is not necessary for these repetitions to be entirely within one ground covering element only. For instance, it will be readily recognized that with the ground covering element according to FIG. 11 the foot-end end face consisting of delimiting line 29 with two end sections at the flanks of the defined squares 34 is convertible by parallel displacement into the end face of the head consisting of delimiting line 29 with the two delimiting lines 22 provided at the ends. As delimiting lines 22 extend further outwards, a convertibility in the opposite sense is not possible. Therefore, the mosaic pattern describing the different possibilities of laying for instance of FIGS. 11 and 13 must not coincide with the lateral or front-end delimiting lines of head 12 and foot 16.

It also goes without saying that the composite structures shown and described can be continued in the same manner in every direction.

The elements to be laid in a composite structure are described in general only by their delimiting line. Perhaps apart from a chamfering at the upper edge of the element a constant solid cross section of all the ground covering elements considered will be provided. Yet as an alternative it is also possible to design the elements as known vertically interlocking stones.

Normally it is a condition for the possibility of laying the elements in the genuine herringbone pattern considered essential and shown in FIG. 13 that the "imaginary" octagon of head 12 which is described by its corners 1 to 8 and which, in the case of FIGS. 11 to 13, coincides with the actual indentation line 30 includes an angle of 135° each at the corners. Analogously in the case of FIG. 10 the projecting portion each of the circular delimiting line of the foot between the corners of the inscribed imaginary square constitutes a projection rather than a recess.

The ground covering slab elements preferably have the size of paving stones. Yet they may also correspond to the size of greater pavement plates.

If desired, it is possible to modify the embodiment according to FIGS. 11 to 13 by giving up the mirror symmetry with respect to longitudinal axis A, while retaining all the other features of the invention, and instead providing the foot which remains centrosymmetrical at both longitudinal sides with such an indentation line that the spacing of straight lines disposed at angles of 90° relative to the axis of the ground covering element along the foot is constant. The complementary indentation line in the head as well as the indentation at the end face of the foot then result as a matter of course from the other symmetries and from the joining conditions in the different composite structures considered, in particular in the herringbone structure.

As is well known, the basic form of the known ground covering element in accordance with FIG. 1 or 2 consists of an octagonal head with a square integrally attached to one side of the head. From the outward appearance this provides a non-rectangular ground covering element which does, however, have a number of possibilities of being laid, among them also in a herringbone pattern. As far as can be seen, the ground covering element in accordance with the entering clause is the only one permitting that among stones consisting of head and stem or head and foot if the head is made relatively large as compared to the stem, the head will determine the load conditions. It is advantageous that the shape of the head has affinity to a square basic form rather than a rectangular one. The stem still makes it possible to take up thrust forces in the composite structure, especially when laid in herringbone pattern. Finally, head and stem can be separated optically by the dummy groove so that the impression of single elements of the form of head and stem being laid in a composite structure can be created.

The basic form including an octagonal head and a square attached to the same as stem or foot is not provided with any such delimiting lines as can hold other neighboring ground covering elements together in clamp-like fashion, as is the case with a genuine composite fitting stone. For this reason it was already considered above to provide the basic outline of octagon and square with additional interlocking faces in the form of alternating projections and indentations.

The embodiment shown in FIG. 10 as well as that according to FIGS. 11 to 13 are a further development of the head-foot ground covering slab element of such nature that an indentation line provided at the foot affords the least possible weakening of the foot by notching effect.

The fact that the interengaging indentation line of the foot extends only outside of the inner area of the square basic shape of the foot in form of an imaginary square, one side of which coincides with the side of the imaginary octagon of the head, makes it possible not to produce any notches of the indentation line projecting into the square basic shape so that the indentation line does not weaken the imaginary square of the foot in addition by the formation of notches. Even if the indentation line of the foot should itself follow a curved, a partly curved or partly rectilinear or a completely rectilinear zig-zag line, the resulting notches are offset toward the outside so that any remaining notching effect is reduced.

It is understood that an interlocking indentation line in the head of the ground covering element in accordance with the entering clause must correspond to the indentation line in the foot because otherwise the possibilities of joining would no longer be warranted. Yet a detailed description of the indentation line in the head itself may be dispensed with since it is essentially an automatic consequence of the selection of the indentation line of the foot because of the various features of the entering clause and, in particular of the possibilities of joining indicated.

In the ground covering elements according to FIGS. 1 and 2 the foot always has a width smaller than that of the head. For this reason the term "stem" was used. This relative dimensioning of foot and head may also be realized in the case illustrated in FIGS. 1 to 13. Yet it is not excluded that the foot may have the same width as the head or may even be larger than the head. For this reason the more general term "foot" may be used instead of "stem". However, the preferred embodiments still are those arrangements in which the foot is narrower than the head.

Furthermore the indentation line in the head which is complementary to the indentation line in the foot may result in the fact that the head is no longer octagonal but instead has a greater number of corners, in particular a total number of eight corners plus an even numbered multiple of four corners. This calculation includes such corners which come to lie in the joining area of the foot when the head is supplemented symmetrically.

The inner area of the imaginary square is understood to be the open amount of points surrounded by the square but not necessarily also the border, in other words the delimiting line of the assumed square itself.

In this sense the indentation line of the foot can touch the imaginary square. Complete agreement between the indentation line and the delimiting line of the imaginary square is not understood to be a case of touching. Touching rather is only understood to be a condition at which the indentation line lying partly outside of the imaginary square may coincide in another part with the delimiting line of the imaginary square.

This agreement may be given either line-wise or alternatively only in points. With the latter alternative the indentation line of the foot touches the imaginary square preferably only at the four corners thereof.

Furthermore, it is possible for the indentation line of the foot to form projections and recesses in the foot itself. However, preferably the indentation line of the foot constitutes only projections. This requires that one projection each of this number of projections is disposed between the corners of the square because otherwise additional setbacks would be created.

A possible arrangement of the kind mentioned last would be formed by a triangle attached to each free side of the imaginary square of the foot or by another convex attachment surface. In the critical case the foot may be a prism standing on its top if the symmetrical supplementing line to the connection between foot and head is assumed in addition. In that case the foot, for instance, may be a square standing on its tip. A particularly simple preferred embodiment in the sense of FIG. 10 is obtained if each projection is defined by a circular arc of a circle which is concentric with the imaginary square. In that event the basic form of the foot is a circular disc.

However, also arrangements in which a projection each is provided at the outer side faces of the imaginary square and an indentation each at the corners are comprised by the scope of the invention as well as arrangements in which an indentation each is provided at the corners of the imaginary square and several projections each with an indentation in between are formed at the outer sides of the imaginary square. A feature which all the embodiments in the sense of the interlocking effect as illustrated in FIGS. 10 to 13 have in common is that the necessity of indentations or recesses of an interlocking indentation line consisting of projections and indentations may be fulfilled at the expense of the octagonal basic form of the head but not at the expense of a reduction in size of the imaginary square of the foot. In the preferred embodiments in which the foot is smaller than the head the head has an inherent excess area which can take up the recesses of the interengaging indentation line without any great notching risk.

It is also within the scope of the invention if the indentation line of the foot instead of touching the imaginary square of the foot extends entirely outside of the sides of the imaginary square.

The corners of the imaginary octagon describing the head may be numbered continuously so that corners 7 and 8 are located next to the foot. Then it is preferably provided that the indentation line of the foot and the side halves of the octagon starting from corners 7 and 8 of the imaginary square define a square each from the outside along three sides between corners 6 and 7 and corners 8 and 1 of the imaginary octagon. Thus two of these defined and localized squares will be sandwiched between the corner areas of adjacent heads in the composite structure. This provides not only an essential improvement of the composite effect but also affords a unique appearance.

At this constellation the indentation line of the foot preferably may extend between the defined squares parallel to the sides of the imaginary square. This has the rather original result that the actual outline of the head remains that of a normal octagon delimited by straight lines without any indentations or recesses ap-

pearing. If, with this arrangement, an imaginary square is inscribed in the foot next to the connecting line of the actual octagonal head designating the transition between head and foot, the center of this square will be somewhat closer to the head than the actual center of a square described by the foot. From this square the defined squares will project at the corners under angles of 45° each.

Preferably it is also provided that the indentation line of the ground covering slab element is formed only by straight delimiting lines. However, as an alternative it is also possible to consider, within the scope of the further teaching of the invention, the use of curvilinear delimiting lines only or mixed cases of straight and curved delimiting lines.

A ground covering slab element in accordance with the preferred embodiment shown in FIG. 1, for example, has a length of faces 18, 20, and 24 of 7.5 cm and of faces 22 and 26 of 4.5 cm. This results in a total length along axis A of approximately 21 cm. Conveniently the smaller face, e.g. 26 corresponds to one fourth to three fourths, preferably one third to two thirds of the length of the greater face, e.g. 13. The lengths of the stone along axis A conveniently are between 18 and 30 cm. The heights of the stone conveniently are between 5 and 10 cm, for example in the ranges of 5, 6, 8, or 10 cm.

The concrete is preferably chosen in accordance with DIN 18501. This is a guarantee of good concrete quality and true measurement. The compressive strength may be grater than or equal to 600 kp/cm².

The additives preferably are selected according to DIN 4226. Typically approximately 350 kg of cement are used per cubic meter of concrete. About 50% of the admixture consists of sand of a particle size range from 0 to 4 mm and about 50% of gravel or other hard stone of a particle size ranging from 4 to 8 or perhaps from 4 to 16 mm. It is convenient to select the additives between screen characteristics D and E of the German Industrial Standard mentioned.

It is not only the slab element according to FIG. 1 as shown in FIG. 14 but also all the other modified embodiments which make it possible for one person laying the stones to pick up the element with one hand. As shown in FIG. 14, the hand grips over the head of the element and the fingers come to lie against side faces 26 of head 12 which extend under 45° C. and are located next to stem or foot 16. This is a particularly favorable opportunity when the slab element according to FIG. 1 has the above mentioned proportions because then the center of the operator's hand lies approximately above the center of the mass of the entire element 10 consisting of head and stem. But also the other embodiments of the invention can still be laid by one hand only if they are dimensioned approximately analogously as described for the stone according to FIG. 1. The above mentioned limits for the determination of size are so selected that the possibility of laying the stones by one hand is guaranteed and, on the other hand, an individual stone will still cover the maximum area.

FIG. 15 shows a preferred modification of the already preferred embodiment according to FIG. 1, modified by chamfering 40 which extends along the entire upper edge of slab element 10. This chamfering 40 conveniently is obtained by bevelling of the edges under 45° as shown especially clearly in the vertical section of FIG. 16a.

The geometric form of the chamfering 40 extends not only around the upper edge of the stone but continues along head 12 and stem 16 within dummy groove 14, both opposed flanks 42 and 44 of which essentially or preferably exactly correspond to the correspondingly inclined parallel chamfering 40, as to depth and inclination. As shown especially clearly in the sectional enlargement according to FIG. 16b the flanks 42 and 44 of dummy groove 14 have a frustoconical cross section with a horizontal groove bottom 46.

FIG. 16c shows that, apart from tolerances determined by the laying, exactly the same frustoconical cross section is formed by the opposed chamferings 40 and the intermediate joint sand 48 of two neighboring slab elements 10 in a composite structure. The width of the groove bottom 46 consequently corresponds to the average joint spacing between slab elements 10 laid adjacent one another. Thus an observer of the composite structure can hardly tell whether certain heads 12 and stems 16 belong to the same slab element or to neighboring slab elements.

Preferably neither chamfering nor a dummy groove are provided at the underside of the slab elements.

A typical production method of slab elements according to FIG. 15 results from the illustration of the mold shown in FIGS. 17 and 18. The mold frame 52, of which FIG. 18 is a top plan view, is placed on vibration table 50. The frame comprises a very solid continuous outer frame 54 subdivided at its inside into a great number of cells 56 having cell walls 58. The interior shape of the cell walls corresponds to the outlines of the slab elements according to FIG. 15 which are to be produced. The mold frame may be made of iron or steel. Each of the cells 56 is closed at its bottom by the vibration table 50. For reasons of saving space cells 56 are distributed in frame 54 in accordance with the rhythm of the structure shown in FIG. 5 so as to make the fullest possible use of the rectangular basis of the machine. The above mentioned limits of the dimensions are also adapted to the opening widths of commercially available machines.

First cells 56 are filled with raw concrete. To obtain the finished stone the mold is then vibrated and pressure is exerted on the upper side of the raw concrete filled into cells 56 by means of a temper head 60 which may be operated in any known manner, for example hydraulically, and which acts through individual rams 62 and a pressure plate 64 associated with each individual cell 56. It is convenient to make the arrangement such that one ram 62 will become effective above the stem 16 and another one above the head 12 of a slab element 10 to be produced. Release from the mold is effected by horizontal relative displacement of mold frame 52 and vibration table 50, a measure which alone avoids the formation of impressions at the underside of the element.

On the other hand, however, the geometric forms of dummy groove 14 and of the continuous chamfering 40 at the upper side of slab element 10 are formed by corresponding complementary projections 66 and 68 at the underside of pressure plate 64 when pressure is exerted on the raw concrete. The raw concrete mass is thus displaced by projections 66 and 68.

Edge stones and supplementing stones belong to each non-rectangular paving stone to be laid in a composite structure in order to be able to obtain a pavement with rectilinear or rectangular delimitations. Often supplementing stones of different shapes must be available, for instance in the case of a rectangular composite structure of slab elements 10 according to FIG. 19 the special forms 10a and 10b drawn specifically in FIGS. 20a and

20b must be available. All the other straight line marginal areas may also be composed of these especially formed stones. As will be seen, 10u has the square shape of a stem 16 of a slab element, whereas 10v has the shape of part of a head 12, namely that part of the head which is disposed above and at one side of stem 16 but not at the other side.

In this context it is left out of consideration that, as customary with such rectangular composite structures, a part designated 70 and marked by hatching in FIG. 19 must be hit off from the respective element disposed at two diagonally opposed corners of the composite structure. As an alternative, further special shapes of corner stones could be held on stock. Yet this is uneconomical and generally not practiced.

As a result of the embodiment selected in accordance with the invention of a slab element 10 whose head 12 and stem 16 can be separated by breaking along dummy groove 14, if required, the dummy groove 14 may continue into the area of edge stones used in a composite structure so as to give the entire composite structure a uniform appearance. Thus a single type of edge stone 10x or, as an alternative 10y according to FIG. 20c or FIG. 20d is sufficient. The edge stone 10x results from an assumed composition of stem element 10u with partial head element 10v at the normal location of dummy groove 14, whereas edge stone 10y results from an assumed attachment of stem element 10u to side face 24 of partial head element 10v.

As the assumed connecting line between partial elements 10u and 10v is formed by the actual dummy groove 14 along which edge stone 10x or 10y can be broken and separated again into partial elements 10u and 10v it is indeed sufficient with slab element 10 according to the invention to keep a single edge stone 10x or 10y on stock and to divide the same, if required, by breaking into the two partial elements 10u and 10v.

FIG. 19 illustrates the possibilities of laying a composite structure as shown in FIG. 3 with slab elements according to FIG. 1 or FIG. 15 and with edge stones 10x. Analogous conditions exist with other composite structures, other shapes of stones of the kind described and when the alternative edge stone 10y is used.

What we claim and desire to secure by Letters Patent is:

1. Slab elements for paving ground areas, each of said elements being a single piece of concrete consisting of a head portion and a stem portion meeting at a dummy groove allowing, but not necessitating, breakage of said slab elements into heads and stems along said dummy grooves and being delimited by two opposite end faces of equal length joined by opposite sides that form angled traces about a longitudinal axis common to said head and said stem, each said angled trace being formed by a succession of sides comprising at said head an inclined side face inclined at 45° in one direction relatively to said axis, a lateral side face extending lengthwise with respect to said axis, and another inclined side face inclined at 45° in the opposite direction with respect to the said axis, and comprising at said stem a lateral side face extending lengthwise with respect to said axis, each said lateral face of said stem being complementary to a lateral face of said head, said end face of said head together with said inclined sides of said head and said lateral faces of said head and said dummy groove describing a centrally symmetrically octagon, said dummy groove together with said end face of said stem and said lateral faces of said stem being symmetrical about the center of said stem, and said head and said stem being mirror symmetrical about said longitudinal axis.

2. Ground covering slab element as claimed in claim 1, wherein said end face of said stem, said lateral faces of said stem and said dummy groove merge without discontinuity and describe a circle.

3. Ground covering slab element as claimed in claim 2, wherein said end face of said head and said lateral faces of said head respectively define concave circular arcs of equal length and each complementary to the arc of said end face of said stem.

4. Ground covering slab element as claimed in claim 1, wherein said end face of said stem, said lateral faces of said stem and said dummy groove together describe a square.

5. Ground covering slab element as claimed in claim 4, wherein each of said end faces, said inclined sides and said lateral faces, is rectilinear.

6. Ground covering slab element as claimed in claim 5, wherein furthermore said dummy groove is rectilinear and parallel with said end faces.

7. Ground covering slab element as claimed in claim 1, wherein said end face of said head, said lateral faces of said head, said inclined sides of said head and said dummy groove together describe an octagon, with equal lengths of said end face, said lateral faces and said dummy groove, and with equal lengths of said inclined sides of said head.

8. Ground covering slab element as claimed in claim 7, wherein the octagon is a regular octagon in which all said lengths are equal.

9. Ground covering slab element as claimed in claim 7, wherein said inclined sides of said head are each shorter than said end face of said head.

10. Ground covering slab element as claimed in claim 1, wherein the top surfaces of said head and said stem are visually differentiated.

11. Ground covering slab element as claimed in claim 1, wherein said element is free from vertical openings extending therethrough.

12. A composite paving structure consisting essentially of ground covering slab elements, said elements being laid laterally side by side so as to form a substantially continuous paving, each said element being a single piece of concrete consisting of a head portion and a stem portion meeting at a dummy groove allowing, but not necessitating, breakage of said slab elements into heads and stems along said dummy grooves and being delimited by two opposite end faces of equal length joined by opposite sides that form angled traces about a longitudinal axis common to said head and said stem, each said angled trace being formed by a succession of sides comprising at said head an inclined side face inclined at 45° in one direction relatively to said axis, a lateral side face extending lengthwise with respect to said axis, and another inclined side face inclined at 45° in the opposite direction with respect to said axis, and comprising at said stem a lateral side face extending lengthwise with respect to said axis, each said lateral face of said stem being complementary to a lateral face of said head, said end face of said head together with said inclined sides of said head and said lateral faces of said head and said dummy groove describing a centrally symmetrical octagon, said dummy groove together with said end face of said stem and said lateral faces of said stem being symmetrical about the center of said

stem, and said head and said stem being mirror symmetrical about said longitudinal axis.

13. A composite ground covering structure as claimed in claim 12, wherein said elements are laid in herringbone bond pattern with said axes of said elements in one row thereof disposed at an angle of 90° to said axes of said elements in an adjacent row thereof and with said stems of said elements in a row thereof inclined in like sense at an angle of 45° to the direction of the row.

14. A composite ground covering structure as claimed in claim 12, said structure further comprising at least one supplementing slab element, said at least one supplementing element having the same peripheral configuration as said stems of said elements.

15. A composite ground covering structure as claimed in claim 12, wherein a single type of edge stone is provided composed integrally of a head and a stem complementary to said slab elements with the exception of the edge line and being connected at a dummy groove substantially equally shaped as said dummy groove of said slab element.

16. A composite ground covering structure as claimed in claim 12, wherein the top edges of each said slab element are chamfered and each dummy groove has a frustoconical cross-section broader at the top, the flanks of which have substantially the same depths and inclinations as said chamfered edges, and wherein the bottom of the groove has a length substantially equal to the gap between adjacent elements of the composite ground covering structure.

17. A composite ground covering structure as claimed in claim 12, said elements further comprising differentiation means whereby their respective heads are visually differentiated from their stems so that said composite structure, though composed of identical elements, gives the appearance of consisting of differently shaped stones.

18. A composite ground covering structure as claimed in claim 12, said structure including at least one set of said elements consisting of four said elements laid at right angles to one another and each with said end face of its head confronting a side face of said stem of an adjacent element of the set so that said heads of the four elements define between their respective adjacent lateral side faces a space corresponding in area to one of said stems.

19. A composite ground covering structure as claimed in claim 18, and further comprising a supplementing stone filling said space and having a surface appearance whereby it is visually differentiated from said elements.

20. Slab elements for paving ground areas, each of said elements being a single piece of concrete consisting of a head portion being mirror symmetrical with respect to a central axis and symmetrical to its own center and having its outer delimiting lines form six corners with each other at six successive corners, one to six, of an

imaginary centrosymmetrical octagon, the corners of which each include an angle of 135° and the side of which, formed by said other two corners, seven and eight, is bisected by said central axis, and a stem or foot portion adjacent said side of said octagon formed by said two corners seven and eight and likewise being mirror symmetrical with respect to said central axis and centrosymmetrical with respect to its own center, and comprising an interlocking indentation line constituted by the delimiting lines of said ground covering slab element and consisting of projections and indentations, with parallel displaceability of one end face line of said ground covering slab element into its other one, with attachability of the longitudinal side of said head portion to the longitudinal side of said foot portion, and with attachability of the head-end face of said ground covering slab element to the longitudinal side of said foot portion and of the foot-end end face of said ground covering slab element to the longitudinal side of said head portion, wherein said indentation line of said foot portion extends only outside of the inside area of an imaginary square, one side of which coincides with said side of said imaginary octagon between said corners seven and eight thereof.

21. Ground covering slab element as claimed in claim 20, wherein said indentation line of said foot portion touches said imaginary square.

22. Ground covering slab element as claimed in claim 21, wherein said indentation line of said foot portion touches said imaginary square only at the four corners thereof.

23. Ground covering slab element as claimed in claim 22, wherein said indentation line of said foot portion forms projections only, one of said projections each being disposed between the corners of said imaginary square.

24. Ground covering slab element as claimed in claim 23, wherein each said projection is delimited by a circular arc of a circle concentric with said imaginary square.

25. Ground covering slab element as claimed in claim 20, wherein said indentation line of said foot portion extends entirely outside of the sides of said imaginary square.

26. Ground covering slab element as claimed in claim 25, wherein said indentation line of said foot portion and those side halves of said imaginary octagon starting from said corners seven and eight of said octagon define a square each at three sides, from the outside, between corners six and seven and corners eight and one, respectively, of said octagon.

27. Ground covering slab element as claimed in claim 20, wherein said indentation line is constituted only by rectilinear delimiting lines.

28. Ground covering slab element as claimed in claim 26, wherein said indentation line of said foot portion extends between said defined squares parallel to the sides of said imaginary square.

* * * * *

REEXAMINATION CERTIFICATE (220th)

United States Patent [19]

[11] B1 4,128,357

Barth et al.

[45] Certificate Issued Jul. 17, 1984

[54] **SLAB-ELEMENTS FOR COVERING THE GROUND**

[75] Inventors: **Günter Barth**, Grötzingen; **Fritz Von Langsdorff**, Rastatt, both of Fed. Rep. of Germany

[73] Assignee: **F. Von Langsdorff Bauverfahren GmbH**, Rastatt, Fed. Rep. of Germany

Reexamination Requests:
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No. 90/000,313, Jan. 12, 1983

Reexamination Certificate for:

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Filed:	Feb. 28, 1978

Certificate of Correction issued Oct. 26, 1982.

Related U.S. Application Data

[63] Continuation-in-part of Ser. No. 672,727, Apr. 1, 1976, abandoned.

[30] **Foreign Application Priority Data**

Mar. 29, 1976 [BE] Belgium 165663
Mar. 25, 1977 [DE] Fed. Rep. of Germany 2713354

[51] Int. Cl.³ E01C 5/00
[52] U.S. Cl. 404/41; 52/608; D25/92
[58] Field of Search 52/311, 590, 603, 604, 52/688; 404/22-24, 41-45, 38, 39

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Primary Examiner—Ernest R. Purser

[57] **ABSTRACT**

A slab element for covering the ground is made e.g. of concrete and forms as a single piece. It has a head portion and a stem portion meeting at a notional meeting surface. The element is delimited by two opposite end faces of equal length joined by sides that form angled traces about a longitudinal axis common to the head at the stem, each said angled trace being formed by a succession of sides comprising at said head an inclined side face inclined in one direction relatively to the axis, a lateral side face extending lengthwise with respect to the axis and another inclined side face inclined in the opposite direction with respect to the axis, and comprising at the stem a lateral side face extending lengthwise with respect to the axis which is complementary to the lateral face of the head, the end face of the head together with its inclined sides and its lateral faces and the meeting surface describing a centrally symmetrical octagon, and the meeting surface together with the end face and lateral faces of the stem being symmetrical about the center of the stem. The head may describe a regular octagon. The stem may describe a square. But the stem may also describe a circle. The elements can be laid to form a composite ground covering structure, laid e.g. in herringbone bond pattern, and laid e.g. to include one or more supplementing slab elements of the same peripheral configuration as the stems of the elements.

REEXAMINATION CERTIFICATE ISSUED UNDER 35 U.S.C. 307.

THE PATENT IS HEREBY AMENDED AS INDICATED BELOW.

Matter enclosed in heavy brackets [ ] appeared in the patent, but has been deleted and is no longer a part of the patent; matter printed in italics indicates additions made to the patent.

AS A RESULT OF REEXAMINATION, IT HAS BEEN DETERMINED THAT:

The patentability of claims 9, 13, and 20–28 is confirmed.

Claims 1–8, 10–12 and 14–19 are cancelled.

New claims 29–33 are added and determined to be patentable.

29. Paving stones for covering ground areas by being laid onto them each stone beside others, each said stone being a unitary shaped piece of concrete substantially longer than it is wide and mirror symmetrical relative to its central longitudinal axis,

each said stone consisting of a centrally symmetrical head portion centered on said axis and a centrally symmetrical stem portion centered thereon and of less width than said head portion,

said head portion being delimited by seven rectilinear side faces and a rectilinear notional plane throughout which said head portion is integral with said stem portion, one of said side faces being an end face of the stone, two being inclined outward from said end face at an angle of 45° to said axis, two being lateral faces extending parallel to said axis from said inclined faces, and two being inclined inward from said lateral faces at an angle of 45° to said axis with their respective inner ends delimiting said notional plane,

said stem portion being delimited by said notional plane and three rectilinear side faces of which two are lateral faces extending parallel to said axis from said inner ends and the third is the other end face of said piece,

said lateral faces, said end faces and said notional plane all being of equal length,

said inclined faces all being of equal length but substantially shorter than said end faces and said lateral faces,

each said stone having a rectilinear dummy jointing gap formed in and across its upper side between the said inner ends, each said stone being layable beside others of said stones in any of several different patterns of load-resistant interengagement, including a herringbone bond pattern, in all of which the stones give the surface appearance of octagonal stones laid beside square stones, said dummy jointing gap in each stone constituting a predetermined rupture zone along which the stone if overloaded in a pavement can break without noticeable change of said surface appearance.

30. A paving stone according to claim 29, said side faces of each of said stones being substantially vertical and having oblique chamfered surfaces along their upper edges.

31. Slab elements for paving ground areas, each of said elements being a single piece of concrete consisting of a head portion and a stem portion meeting at a dummy groove allowing, but not necessitating, breakage of said slab elements into heads and stems along said dummy grooves and being delimited by two opposite end faces of equal length joined by opposite sides that form angled traces about a longitudinal axis common to said head and said stem,

each said angled trace being formed by a succession of sides comprising at said head an inclined side face inclined at 45° in one direction relatively to said axis, a lateral side face extending lengthwise with respect to said axis, and another inclined side face inclined at 45° in the opposite direction with respect to the said axis, and comprising at said stem a lateral side face extending lengthwise with respect to said axis, each said lateral face of said stem being complementary to a lateral face of said head,

said groove, said end faces, said inclined faces and said lateral faces each being rectilinear,

said end faces, said lateral faces and said groove having equal lengths,

said inclined side faces having equal lengths but each being substantially shorter than said end face of said head, said end face of said head together with said inclined sides of said head and said lateral faces of said head and said dummy groove describing a centrally symmetrically octagon, said dummy groove together with said end face of said stem and said lateral faces of said stem describing a square and being symmetrical about the center of said stem, and said head and said stem being mirror symmetrical about said longitudinal axis.

32. A composite ground covering structure comprising a multiplicity of paving stones according to claim 29, 30, or 31, laid on a ground surface each beside others and forming a substantially continuous pavement of interengaged stones over said ground surface, said pavement irrespective of the pattern or patterns of interengagement of said stones giving substantially the same surface appearance as a pavement composed of octagonal stones and square stones.

33. A composite ground covering structure according to claim 32, at least some of said stones being interengaged in herringbone bond pattern with the longitudinal axes of stones in a row disposed at an angle of 90° to said axes of stones in an adjacent row and inclined in like direction at an angle of 45° to the direction of the row.

* * * * *

Plaintiff's Exhibit 13

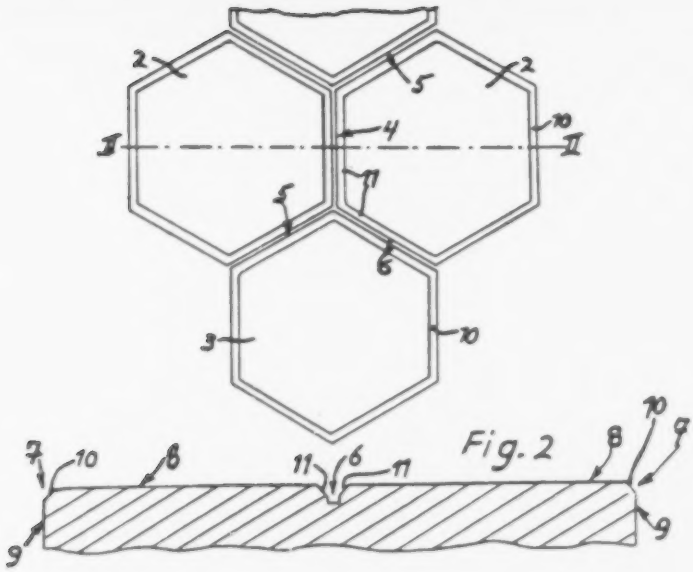

Fig. 2

West German GM 7409912 (PX7H) discloses, in pertinent part:

Thus, it is the object to provide an interlocking paving stone of the type indicated at the outset, which maintains the advantages of a cruciform paving stone of large area but has a good optical appearance and takes account of the desire for paving units of small area.

• • • • • •

A further advantage is that the impression of the pavement is independent of the particular laying manner chosen for such stones. The overall effect achieved is that of a paving arrangement of relatively small area, although relatively large stones may be used.

Groove-like recesses may extend on the border lines of the hexagons defining the basic configuration of the stone, said border lines extending on the surface of the stone. These grooves which are disposed on the surface of the stone and confine the hexagons may be about as wide as the laying gaps between such stones, and in particular are approximately 3 mm wide. The impression that separate hexagonal stones are laid is additionally intensified thereby. The grooves on the top side of the stone may have a rounded cross-section.

• • • • • •

It can be seen especially in Fig. 2 that groove-like recesses 6 extend on the border lines 4 and 5 - which extend on the surface of the stone 1 - of the hexagons 2 and 3 defining the basic configuration of the stone 1. These grooves 6 expediently are of a width corresponding to the width of the subsequent laying or paving gaps . . . . so that, after laying of the stones 1, the impression of a honeycomb-like pavement composed of regular hexagons results, although considerably larger stones 1 could be laid than it would correspond to the individual hexagons.

• • • • • •

It can be seen furthermore in Fig. 2 that the free edges 7 of the stone 1 are provided with a chamfer 10 at the transition between the surface 8 and the lateral areas 9. These edges thus become insusceptible to damages. Chamfers 11 corresponding to the chamfers 10 provided at the edges 7 are also arranged on the surface of the stone 1 as a transition to the visible border lines 4 and 5 of the hexagons 2 and 3. The impression that separate hexagons are present in the compound arrangement is further intensified and improved thereby.

(3)

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No. 88-635

IN THE
SUPREME COURT OF THE UNITED STATES

October Term, 1988

DEMACO CORPORATION,
PAVER SYSTEMS, INC.,
COASTAL CONTRACTING CORPORATION and
R.I. LAMPUS COMPANY,
Petitioners,

- v. -

F. VON LANGSDORFF LICENSING LIMITED and
F. VON LANGSDORFF BAUVERFAHREN GmbH,
Respondents.

ON PETITION FOR A WRIT OF CERTIORARI
TO THE UNITED STATES COURT OF APPEALS
FOR THE FEDERAL CIRCUIT

BRIEF FOR RESPONDENTS OPPOSING PETITION FOR WRIT OF CERTIORARI

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DEMACO CORPORATION,
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Petitioners,

- v. -

F. VON LANGSDORFF LICENSING LIMITED and
F. VON LANGSDORFF BAUVERFAHREN GMBH,

Respondents.[1]

BRIEF FOR RESPONDENTS OPPOSING PETITION FOR WRIT OF CERTIORARI

The petition for Supreme Court review of this case presents no special

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[1]The respondents are corporations owned by inventor Fritz von Langsdorff. They have no parent companies, subsidiaries, or affiliates.

and important reasons for review (Rule 17.1). Its statement of questions, contrary to Rules 21.1(a) and 21.5, is argumentative, presumptuous, inaccurate, and misleading.

Taken even at face value, the petition is based on factual assertions relating to this one case only and the particular patent involved in it.[2] No question of law having any cognizable or general applicability to industry or the public interest is presented in either the statement of questions or the petitioners' argument.

1. Petitioners'Statement of Questions

Petitioners' Question 1 presumptuously and incorrectly assumes that the Court of Appeals for the Federal Circuit (the Court) "eliminate[d] 35 U.S.C. §103

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[2]Barth and von Langsdorff U. S. patent No. 4,128,357 ("Barth patent" SA 9-36).

from the patent statutes" by upholding the respondents' patent.[3] Petitioners' Question 2 presumptuously and incorrectly assumes that the Court's holding is represented by their counsel's comparison of something pictured in his own drawing, which is not evidence of record, with something else pictured in a second such drawing, and thus was a failure "to apply the mandates of this Court in respect of 35 U.S.C. § 103."

Petitioners' Question 1 further assumes, plainly contrary to the Court's

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[3]The petitioners here, after admittedly copying the patented invention (see A 39), have kept the widely licensed Barth patent under attack in burdensome litigation for many years. An earlier related litigation that they supported (see A 48- 49), F. von Langsdorff Licensing Limited et al v. Paver Lock, Inc. et al, Case No. 82-8120 in the Southern District of Florida, resulted on January 25, 1985, in a Judgment with Injunction holding this patent valid, enforceable, and willfully infringed.

opinion and the record, that the Barth patent was granted and upheld "on a paving stone...clearly suggested by the prior art"; and also, again contrary to the Court's opinion, that the Court upheld the patent "merely because that paving stone may have enjoyed commercial success."

2. Petitioners' Statement of the Case

This section of the petition states nothing about the teaching and claims of the Barth patent, nothing about the prior art, and nothing about the differences between the patented invention and the prior art.

While admitting widespread manufacture and sale of "[t]he paving stone covered by the Barth patent" (p. 6), petitioners on pages 6-7 misleadingly describe the origination of this suit,

and pretend that a former fellow infringer, Krehling Industries, Inc., settled for its infringement because of "lack of importance of the product." If the patented product has so lacked importance, it is strange indeed that the petitioners first copied the patent (A 39) and then burdened the patentee and several federal courts for many years, and now would burden this Court, with their attempts to destroy the patent.

The reasons stated in the Federal Circuit Court's opinion for the reversal of the district court's judgment are ignored throughout the petition, with the exception only of a distortion on page 11 of the Court's holding regarding commercial success and a passing acknowledgment on page 17 of a holding by the Court that the patented invention provided "certain desirable benefits (the

paving stone has the same pleasing appearance when laid in different laying patterns)."

That acknowledgment is highly significant. Yet the Court's holdings involved in it are totally ignored in petitioners' statement of questions, their statement of the case, and their argument that the Court's decision conflicts with decisions of this Court and "has eroded" or "effectively removed" the "obviousness section of the patent statutes."

3. Petitioners' Argument

Contrary to petitioners' assertions, the Court of Appeals extensively considered the §103 obviousness issue in its opinion (A 5-29, SA 1), with full regard for the record, the district court's findings, and the applicable law

including this Court's guidepost instructions in Graham v. John Deere Co., 383 U.S. 1 (1966).

Contrary to petitioners's assertion in Question 1, the Barth patent is not "on a paving stone which is clearly suggested by the prior art." Nor is either the patented paving stone or any prior art correctly represented by the drawings (mere counsel arguments) which are asserted in Question 2 and on argument page 14.

The patented paving stone is correctly illustrated in the Court's opinion (SA 1) and in Figs. 15-16 of the Barth patent drawings (SA 22).

The drawing represented by petitioners (p. 14) as showing "a paving stone" shown in a "German newspaper photograph" (SA 37, Plaintiff's Exhibit 13) is neither an exhibit of record nor

warranted by any finding below. Petitioners asserted a 1974 German newspaper publication as prior art. The photograph is not that publication. The evidence of that publication -- a reproduction of a microfiche record of the published newspaper page (Plaintiff's Exhibit 11 at trial) -- is omitted from the petition. The only relevant holding of the district court reads (S 65):

> The prior art also teaches a design having the overall surface appearance of a Barth paver, without a dummy groove, being incorporated into an outdoor ground covering as shown by a microfiche reproduction of a 1974 West German newspaper account of the opening of the Muenster Zoo.

There never has been any holding below that the German newspaper publication disclosed or taught the public anything about a paving stone.

Petitioners totally ignore the patent claim limitations (A 3-4) to

certain dimensional relationships of ten end and side faces and the dummy joint groove, with related center-symmetrical topside head and stem configurations, in each paving stone of the claims. They ignore the Court's related holding (A 9) that "[t]he claimed relative dimensions are not shown in the prior art."

Petitioners also ignore the Court's analysis (A 5-13) of the Barth invention, the combination of properties that it provided, and its relation to the prior art.

The Court's opinion points out (A 5), without challenge in the petition, that the paving stones of the Barth patent claims achieved a result in use, called "the Barth result," of "combining the feature of structural strength obtained from an elongated interlocking paver with the feature whereby, however

the asymmetric stone is laid, the effect is the same symmetric pattern."

Further, the petition fails to mention the Court's important observations (A 8-9) that:

- The art does not show or suggest "this symmetrical paving stone pattern giving the appearance of two different stones" (A 9).
- "Nor does the prior art describe or suggest a stone that gives to paving the structural strength obtained here while achieving a harmonious appearance whatever the pattern in which the stones are laid" (A 9).
- "It was not disputed that the Barth stone possessed a combination of advantages not obtained with prior pavers" (A 11-12).

This new combination of advantages, which as well is a new combination

of properties and a new result in the plural paving stones and the pavement structure claimed in the patent, includes, as acknowledged by infringer-petitioner Paver Systems in its testimony quoted by the Court (A 12-13), the layability of the stones in a herringbone bond pattern important to the strength of the pavement under traffic load, and in a variety of other bonds as well, with achievement of the same appearance pattern in the pavement no matter in which orientations the stones are laid.

Most significantly, petitioners ignore the Court's pervasive conclusion (A 13):

> "We conclude that the district court clearly erred in its analysis of the differences between the Barth paver and the prior art."

That holding plainly belies

petitioners' asserted questions and their argument that the Court's decision is in direct conflict with this Court's rulings in the Graham case and related cases. One of the prime requisites for a determination under §103, as stated in Graham, 383 U.S. at 17-18, is that "differences between the prior art and the claims at issue are to be ascertained."

That holding also belies petitioners' assumption that the Court upheld the patent "merely because" the paving stone invention "is novel" and "may have enjoyed commercial success" (Question 1; Petition p. 9).

Petitioners assert (p. 11) that the Court acted "without holding the District Court's findings on commercial success clearly erroneous." Plainly to the contrary, the district court itself

found commercial success to be a fact of the case (A 71), and the Court of Appeals held (A 29) that the District Court "clearly erred" in finding no proof of a "nexus between the Langsdorff patented invention and its commercial success."

Petitioners not only have distorted the case by presumptuous, misleading and untrue arguments. They ignore the fact that the Court's holding regarding commercial success was but one of several factors which required reversal of the district court's judgment. The fundamental basis for the reversal is that the petitioners had failed to carry their burden of establishing invalidity of the Barth patent.[4] The Court's opinion points out:

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[4]35 U.S.C. § 282: Presumption of validity; defenses

(Continued)

> Viewing all the factors pertinent to determination of obviousness, applying the guidelines of Graham v. Deere, leads us to conclude that the presumption of validity had not been overcome by clear and convincing evidence (A 29).

It is manifest from the opinion of the Court of Appeals for the Federal Circuit, and from the record as well, that the decision below is in full accord with the decisions of this Court in cases involving issues of obviousness under 35 U.S.C. § 103. The paving stones invention of the Barth patent, unlike the invention at issue in Sakriada v. Ag Pro, Inc., 425 U.S. 273, 282-283 (1976), did indeed produce a "new or different function." This invention, unlike the invention at issue in Anderson's Black

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[4] (Continued)

> A patent shall be presumed valid.* * * The burden of establishing invalidity of a patent or any claim thereof shall rest on the party asserting such invalidity. * * *

Rock, Inc. v. Pavement Salvage Co., 396 U.S. 57, 63 (1969), did indeed provide "more than" a mere "successful venture." Petitioners backhandedly admit as much by their acknowledgment (p. 17) that the Barth patented invention provided "certain desirable benefits" in that "the paving stone has the same pleasing appearance when laid in different laying patterns."

CONCLUSION

The petition of patent infringers Demaco Corporation et al for a writ of certiorari to the United States

Court of Appeals for the Federal Circuit is clearly without merit. It should be denied forthwith.

Respectfully submitted,

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CERTIFICATE OF SERVICE

I hereby certify that the foregoing BRIEF FOR RESPONDENTS OPPOSING PETITION FOR WRIT OF CERTIORARI has been served upon Russell D. Orkin, Esq., counsel of record for petitioners, by mailing three copies thereof by First Class Mail, postage prepaid, in an envelope addressed as follows:

Russell D. Orkin, Esq.
Webb, Burden, Ziesenheim & Webb, P.C.
515 Oliver Building
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this 19th day of October, 1988.

Albert C. Johnston

Albert C. Johnston
Counsel of Record for Respondents